SPERRY

PERSONAL COMPUTER SYSTEM

Operating Guide for DOS 2.11

Personal Computer Library
UP-10485

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WARNING: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

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- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
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This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

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LIMITED WARRANTY

1. The following is the LIMITED WARRANTY provided to Sperry customers for the SPERRY Personal Computer (PC).

   (a) The equipment and the media in which the software is furnished are warranted to be in satisfactory working order for a period of ninety days after delivery, subject to the limitations in paragraph (b) below. Should any warranted item fail to be in satisfactory working order during its warranty period, Sperry will, at its option, repair or replace the defective item at no additional charge except as set forth in paragraph (b) below. Sperry will furnish replacements or repaired items on an exchange basis and they will be reconditioned or new. All replaced items become Sperry's property.

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   (d) All programs (excluding any Sperry-supplied permanently embedded microcode), data, storage media not requiring service, non-Sperry parts, non-Sperry options, non-Sperry attachments, and non-Sperry alterations must be removed before any item is returned to Sperry for service. The Customer agrees that if any such material is not removed, it will be deemed to have been discarded.

(e) Except for the warranty in paragraph (a) above, the PC is furnished "AS IS" and THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE. SPERRY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE. Any other service will be subject to availability and Sperry's then current charges and conditions.

(f) THIS WARRANTY GIVES THE CUSTOMER SPECIFIC LEGAL RIGHTS, AND THE CUSTOMER MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. If the equipment or media is defective and qualifies for service under this LIMITED WARRANTY, the Customer must do the following to obtain this service:

(a) Perform problem determination procedures, which include diagnostic testing, in accordance with Sperry's furnished instructions.

(b) Call Sperry at the telephone number furnished to the Customer in a form supplied with the PC. If the Customer cannot locate this telephone number, call the nearest Sperry Computer Systems office.

(c) During the telephone conversation furnish Sperry the requested information, for Sperry to provide this service.

(d) After performing the Sperry problem determination procedures and conversing with Sperry, if the item still qualifies for service, the Customer must do the following:

1. Remove all programs (excluding any Sperry supplied permanently embedded microcode), data, storage media not requiring service, non-Sperry parts, non-Sperry options, non-Sperry attachments, and non-Sperry alterations. (If any is not removed it will be deemed by Sperry to have been discarded by the Customer.)

2. Fill in and submit with the failing item a form designated by Sperry for this service.

3. Bring or ship the failing item to the facility designated by Sperry. If it is brought to an Over-the-Counter (OTC) facility, it must be brought in during Sperry's normal working hours.

4. If Sperry designates a Central Repair Service (CRS) facility, the Customer must pack the PC in its original container or a Sperry replacement container. The Customer must prepay shipping charges and will bear the risk of loss or damage during transit.

5. Sperry will perform the service. If the service is performed at an OTC facility, Sperry will notify the Customer upon completion of the repair and the Customer will promptly pick up the serviced item. If the service is performed at a CRS facility, Sperry will arrange for return shipment upon completion of repair. Sperry will pay non-premium shipping charges and bear the risk of loss or damage for the return shipment to locations in the continental United States, Hawaii, and Puerto Rico. Expedited shipment will be available at an additional charge.

Preface

This Operating Guide is intended as a general introduction to the many capabilities of the SPERRY Personal Computer System. For more detailed information on specific aspects of the Personal Computer System, refer to the appropriate software book.

This book includes the following chapters:

Chapter 1. Introduction

This chapter introduces the SPERRY Personal Computer (PC) System and describes the organization of this book.

Chapter 2. System Installation

This chapter provides instructions for installing the PC system.

Chapter 3. Operation

This chapter explains the basic operation of the PC system and describes the keyboard and diskette systems.

Chapter 4. Introduction to DOS

This chapter provides a general introduction to the Disk Operating System (DOS)* software, including information on how to create files and how to back up (copy) system diskettes.

Chapter 5. Introduction to BASIC

This chapter describes how to load BASIC** and how to use some of BASIC's common commands.

Chapter 6. Problem Solving

This chapter provides help in diagnosing and fixing problems that could occur during operation.

Chapter 7. Options

This chapter describes installation and operation of options that can be added to the system.

* *The disk operating system (DOS) used by the SPERRY Personal Computer is a form of MS-DOS, a product of the Microsoft Corporation. In this book we refer to MS-DOS simply as DOS.*

** *The BASIC used by the SPERRY Personal Computer is a form of MS-BASIC, a product of the Microsoft Corporation.*

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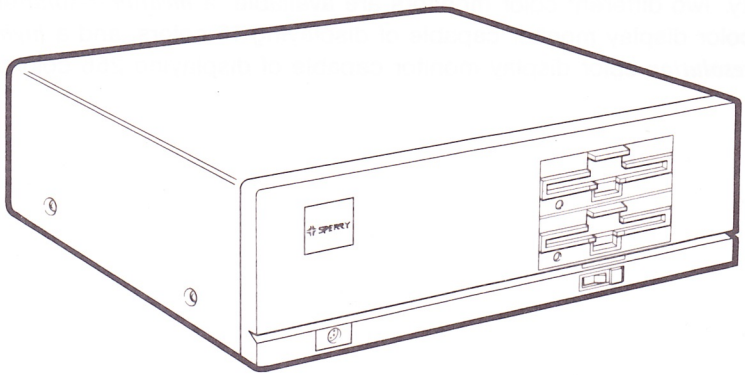
Chapter 1. Introduction

System Overview

The SPERRY Personal Computer System is made up of four components:

The System Unit

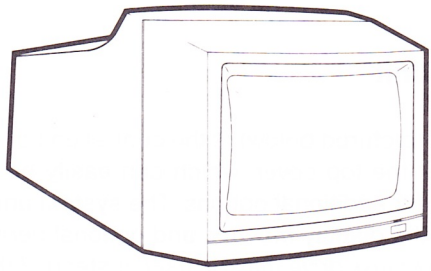
The system unit (pictured below) is the central unit of your personal computer. Under the top cover, which can easily be removed, are expansion slots for additional options. The system unit controls the diskette drives, the display monitor, and optional peripherals, such as printers. A *fixed disk* drive may be used instead of the lower diskette drive.



Display Monitor

The Display Monitor

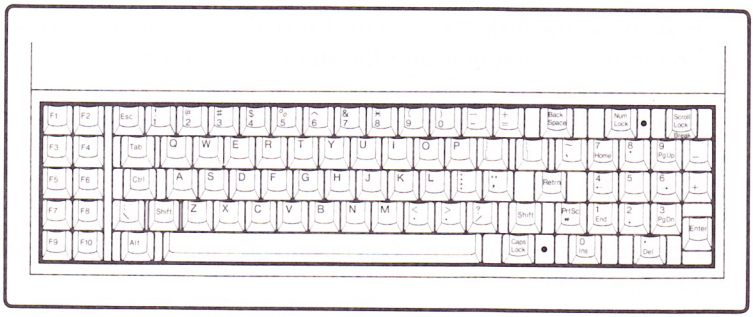
The primary monitor for the PC system is a 12-inch monochrome display (green letters on a black background). It can display up to 80 columns of data on up to 25 lines.



The SPERRY Personal Computer also has full color display capability. Two different color monitors are available: a *medium-resolution* color display monitor capable of displaying 16 colors, and a *high-resolution* color display monitor capable of displaying 256 colors.

The Keyboard

Your input to the PC is through the keyboard. The keyboard includes all of the usual typewriter keys plus a variety of editing and special function keys. A group of numeric keys, similar to that on an electronic calculator, is also provided. The keyboard is discussed in greater detail in Chapter 3.



Peripherals

Peripherals are devices, such as printers, that can be attached to your PC system. Peripherals may come with your system, or you may want to add them later. Either way, you should consider peripherals part of your total personal computer system.

Organization of This Book

This book is about using the SPERRY Personal Computer. It includes information about:

- How to get the PC system up and running.
- How to use the keyboard to enter data.
- How to use the diskettes and the fixed disk for putting information into the computer and for storing your data.
- How to load the DOS software and use some of the commands.
- How to load BASIC and write simple BASIC programs.
- How to determine if your PC is having problems, and if so how to solve them.
- How to install and operate the options that you may add to your system.

This book is designed to make it easier for you to learn at your own pace. It includes mostly short sections to make it easier to find what you are looking for. The practice exercises and examples in each section invite you to try new skills before you get into the more extensive descriptions found in the software books.

Index and Glossary

In the back of this book you will find a complete index and glossary. Words found in this glossary are italicized in the text when they are first presented. For example:

The word *software* refers to instructions that the computer needs to operate. Software is the general name for the programs you load into the computer's memory from a *diskette* (sometimes also known as a "floppy disk"), or from a fixed (hard) disk.

The words "software" and "diskette" are italicized above because this is the first time they appear in text in this book. They are both defined in the glossary.

Combined use of the index and glossary can also be a quick way to find what you are looking for. The glossary may provide the answer by better defining the subject; if not, the index should lead you to the right place in the book.

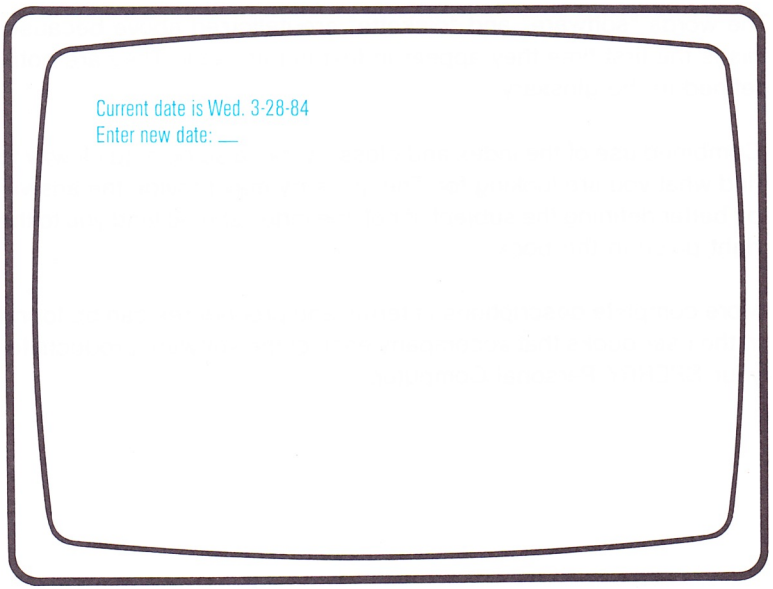
More complete descriptions of terms and procedures can be found in the user books that accompany each of the software products for your SPERRY Personal Computer.

Using This Book

How to Use This Book

If you take a moment to look through this book, you will notice that the color blue is used throughout.

Both the characters you type on the keyboard and the responses from the PC that appear on the screen are printed in blue. The screen displays will be printed within a border representing the monitor's screen, as follows:



Most chapters include examples of screen displays. All such displays are printed to look like what will actually appear on your screen.

To help you understand and remember important points, reminders are printed in blue-bordered boxes, like the one on the right. These boxes contain special notes and definitions.

NOTE:

Pay special attention to definitions and notes found in these blue boxes.

Chapters are divided by a different color paper stock, with a brief table of contents printed on each divider page.

As you look through a chapter, you will see the chapter title at the top of every right-hand page, and the main section at the top of every left-hand page. For quick searches through the entire book, there are key words in a blue background along the edges of the pages.

These were all added to make the book easier to use as you are learning, and easier to use later for quick reference.

Before You Begin

This book is not meant to be only an attractive addition to your library shelf. It is meant to be used.

There are many blank pages in the book for your notes. But don't restrict your note-taking to the designated pages. Go ahead and make notes in the margins, make notes and drawings to improve your understanding of the illustrations and tables, draw in arrows and diagrams, and circle important points. With the loose-leaf format you can even add more pages.

Make the book most usable for *you*.

If you find any problems, any errors, or any places in the book you think could be made clearer, let us know. There is a mail-in card at the back of this book. Or mail your comments to:

SPERRY Personal Computer
User Publications
SPERRY Computer Systems
322 North Sperry Way
Salt Lake City, Utah 84116

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Chapter 2. System Installation

Installation

This chapter describes the steps to go through to get your SPERRY Personal Computer up and running. It assumes you have already unpacked each of the components of the system and have them ready to go.

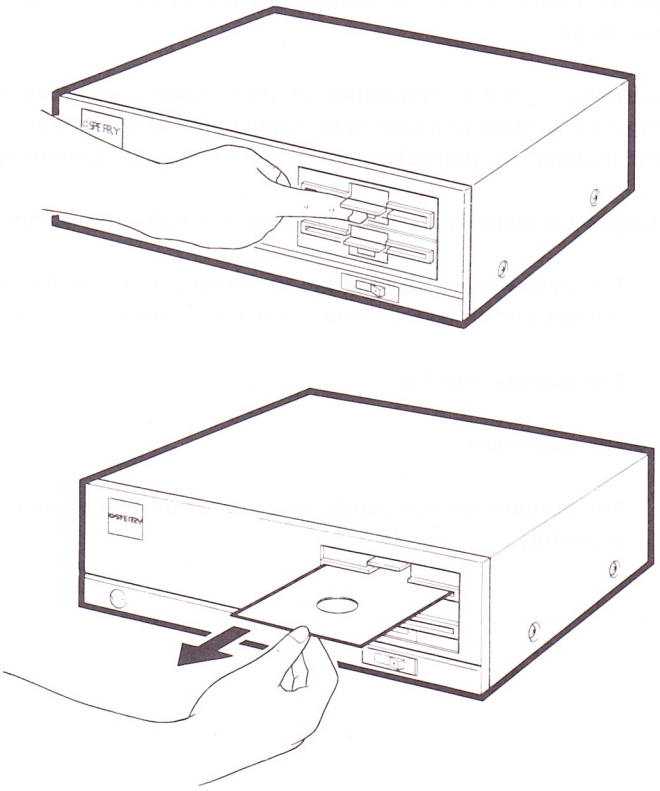
Depending on the configuration of your system, you may have to remove the system unit casing to install optional components. Refer to the installation instructions that came with your system options.

To begin the installation, you will need the following components:

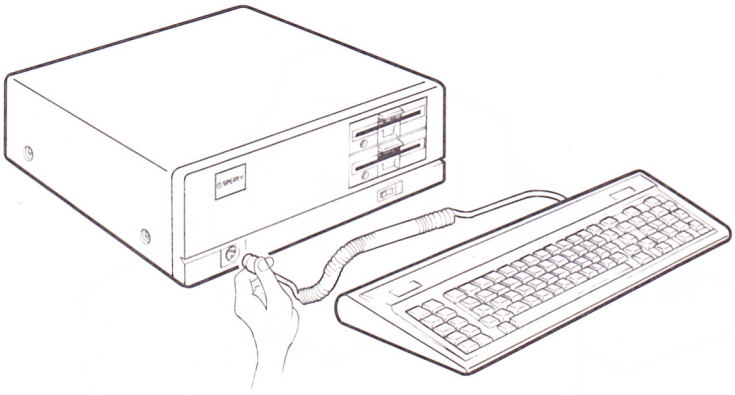
- The system unit. (It may be necessary to install the internal printed circuit boards that control the various components)
- The display monitor
- The keyboard
- Any peripherals you plan to add to your basic system (such as a printer)

Installation Steps

1. Place the system unit on a stable, flat surface. If the diskette drive door is not already open, open it by pressing the center of the drive door. Remove the shipping cards from the diskette drives.



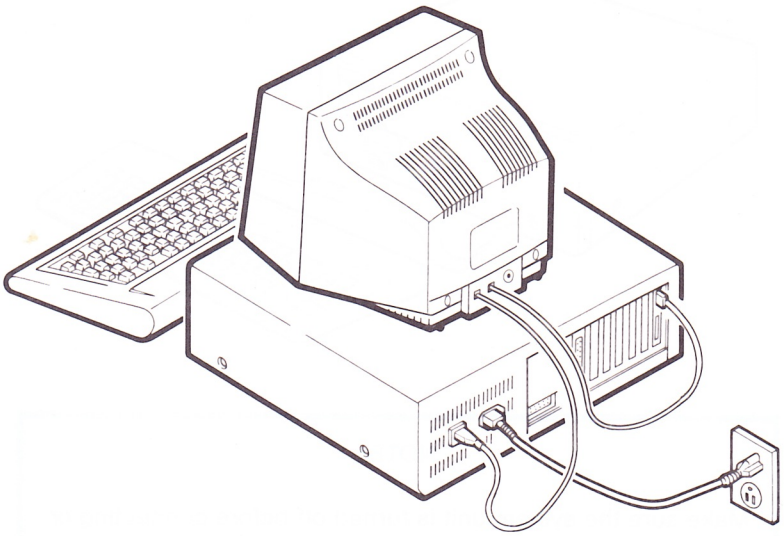
2. Place the keyboard in front of the system unit. Connect the keyboard to the system unit by plugging the coiled cord from the keyboard into the left front of the system unit, as shown in the illustration below.



NOTE:

Make sure the system unit is turned off before connecting or disconnecting the keyboard.

3. Place the display monitor near or on top of the system unit. Connect the two cables from the display monitor to the rear of the system unit, as shown in the illustration below. Plug the power cord (the one with the 3-pronged plug) into the receptacle at the left rear of the system unit.



This will automatically supply power to the display monitor when the system unit power switch is turned on.

NOTE:

The monochrome display monitor must be plugged into the system unit. If you are using a color display monitor, it can be connected to a separate electrical outlet.

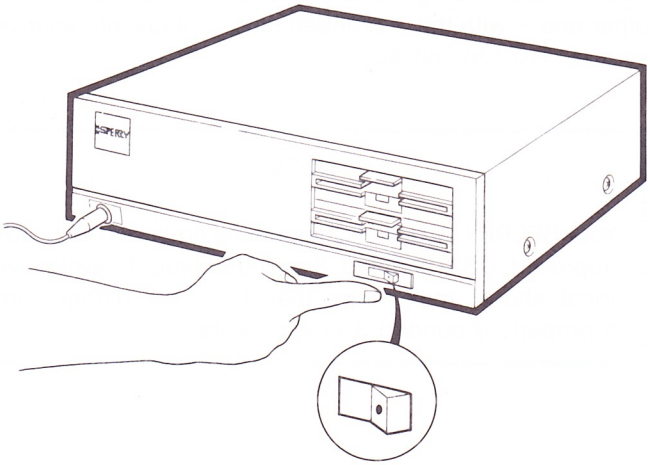
The other cable from the display monitor (the one with the 9-pin, D-shaped plug) plugs into the receptacle on the right side of the back of the system unit. You can secure the two small screws on the ends of the plug to keep the plug firmly in place.

4. Plug in the system unit power cord. One end plugs into the receptacle on the right side of the back of the system unit. The other end — with the 3-pronged plug — plugs into your power source (110/120-volt AC).

NOTE:

Your SPERRY Personal Computer is equipped with a UL-approved, CSA-certified, 3-pronged plug. To avoid electrical shock, make sure that it is only plugged into a properly grounded 3-hole receptacle.

5. Now you are ready to turn the system on. Push the power switch on the right front of the system unit. A red light next to the switch will come on and after a few moments you will hear a beep. This beep indicates that a self-test has taken place and the system has found all to be in order.



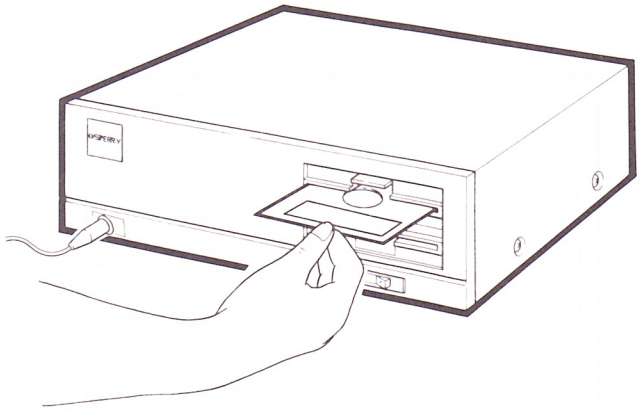
Now, as soon as you *load* some *software*, you are ready to work.

After the self-test is completed (and the beep sounds), the system immediately begins testing to see if a DOS (Disk Operating System) diskette is in the top diskette drive. It is looking for a set of instructions to guide its operation. These software instructions are loaded into the computer by inserting a DOS diskette into the *default* diskette drive (the one set to operate automatically – it will be the top drive if you have two drives in your system unit).

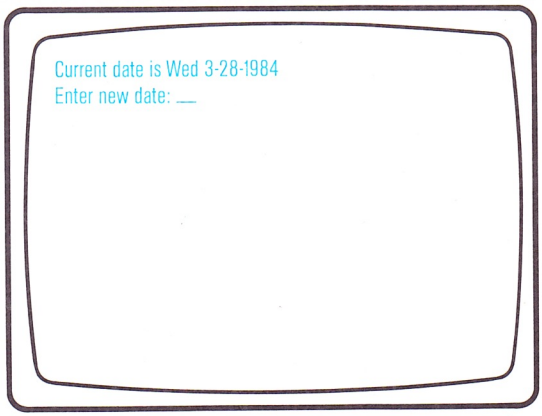
NOTE:

Remember, words that appear in the Glossary are italicized the first time they appear in the text.

When you insert your DOS diskette into the default drive, the system will read the information coded on the diskette and store it in its *memory*. (Normally, the DOS diskette is inserted in the default diskette drive before you turn the system on.)

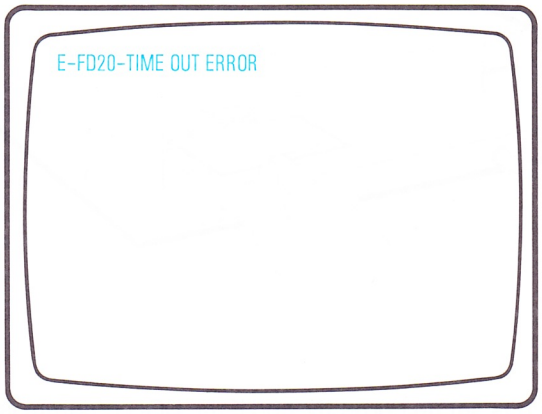


If the system is set up correctly, and if the DOS program is the right one for your system, the screen will look something like this:



If the screen does not display the date and ask you to enter a new date, refer to Chapter 6.

If there is no DOS diskette that the system can read in the drive, the system will search for a while, then it will "time out." A message similar to the following will appear:



If this happens, and you have inserted the correct DOS diskette, turn the PC off and try again. If the program still does not load, refer to Chapter 6.

NOTE:

If you have a fixed disk drive, the system will look first for a DOS diskette in the default diskette drive. If the system finds a diskette in the drive, it searches it for the DOS control files. If no diskette is in the drive, the system searches for the DOS control files on the fixed disk.

If the DOS files are neither on a diskette nor on the fixed disk, an error message appears.

If the date prompt has appeared, you are ready to operate the PC system. But before you begin, you should read Chapter 3, which describes system operation, and Chapter 4, which describes the DOS software.

Summary

Installation Summary

1. Remove the shipping cards from the diskette drives.
2. Connect the keyboard cable to the system unit.
3. Connect the two cables from the display monitor to the system unit.
4. Plug in the system unit.
5. Turn on the system unit. The red light comes on and a beep sounds.

If the DOS software is loaded, the date prompt will appear.

NOTE:

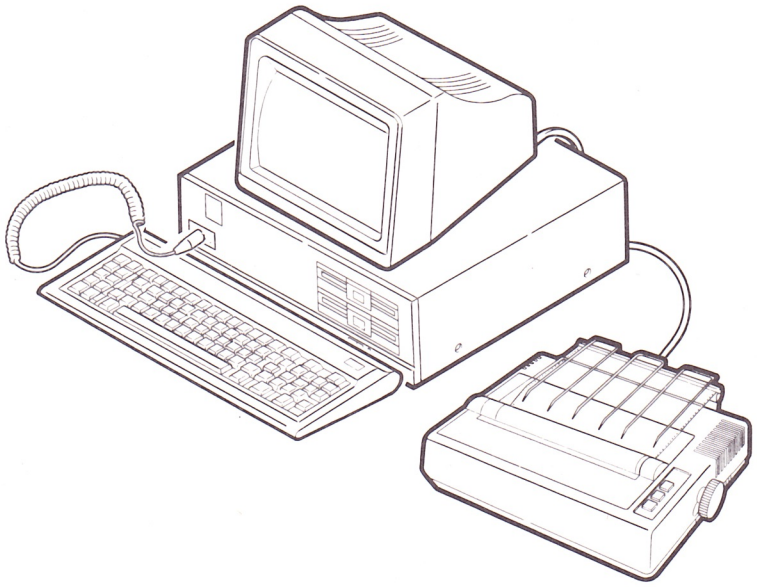
Do not operate your PC system until you have made a backup copy of the DOS control diskette. Refer to Chapter 4 for the appropriate copying method.

Configuration

This illustration shows a typical configuration of the SPERRY Personal Computer System.

The exact configuration of your system may vary, depending on which display monitor and keyboard you are using, and on any peripherals added to the system.

The locations of the plugs on the back of the system unit may also vary slightly, depending on which optional controller boards are installed.



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Chapter 3. Operation

Introduction

This chapter covers the basics of the SPERRY Personal Computer system. However, much of the information about how to use any computer is dependent on the software you are going to use to control it. So, after you have read this chapter, read the more detailed information about software operation in Chapters 4 and 5.

This chapter covers the following four main topics:

- The keyboard
- Diskettes and diskette drives
- The fixed disk drive
- Peripherals

The Keyboard

This section illustrates and describes each section of the personal computer's standard keyboard.

In this chapter, keys are organized into groups according to function. First, the entire keyboard is pictured, with the group of keys being discussed highlighted in blue. Then, individual keys in that section are illustrated and described.

If you think of the keyboard as organized into these functional groups, you will find it easier to remember the purpose of each key.

The computer's keys may be thought of as electronically "painting" a character on the screen, for temporary display, until you are ready to store it in the PC's memory. Each press of the key sends one character to the screen. In addition, all of the PC's keys that display a character on the screen have the *cycling* function; that is, holding down the key will cause the computer to continue entering the character. Try it. No matter what software you have loaded, the keys should "cycle" as long as you hold down the key.

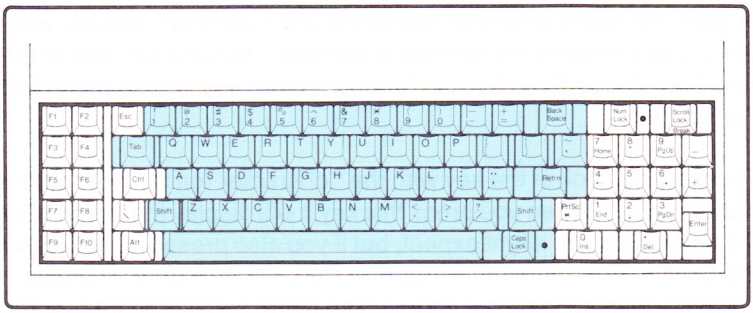
When entering a command, you can type a sequence of characters from the keyboard and then look it over and change it until you are sure it is the message you want to send to the computer's control system. The computer does not act on the message until you are ready to "enter" it. (With some software systems — such as word processing programs — the system automatically saves the characters as you enter them.) With most software control programs, you can type in many lines of data before entering them.

Many of the keys have more than one function, called an *alternate function*. On a typewriter we are all used to pressing and holding down the shift key when we want to type a capital letter. The computer uses this same principle: you press and hold down one key while you press a second key in order to activate a second function of that key. Sometimes the alternate function of the key is also printed on the keycap.

For example, look at the key with the * character (on the right side of the keyboard). When you press this key it will display the * symbol on the screen, as you might expect, but if you also press and hold down the **Shift** key, a command is sent to the printer to print whatever is currently displayed on the screen. The **PrtSc** (print screen) function is therefore the alternate function of that key. Often you press the **Ctrl** key (instead of the **Shift** key) to activate the alternate function.

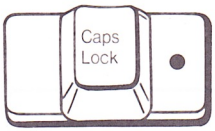
Keyboard

Typewriter Keys



In the illustration above, the keys shaded in blue are the same keys that you normally find on a typewriter. Although some key placements are slightly different, these keys operate much like their counterparts on a typewriter.

Remember that although some letters and numbers can be used interchangeably on a typewriter, the computer treats each keystroke differently. For example, you can't use a lowercase L to indicate the number 1.



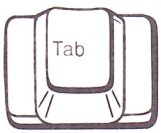
The Caps Lock key, to the right of the space bar, is used to change the uppercase/lowercase setting. When this key is on (uppercase setting), the red light on the right side of the key should be on.

The **Caps Lock** key is a *toggle* key. Press it once to type in all capital letters; press it again to go back to typing in lowercase letters.

DEFINITION: Toggle

The **Caps Lock** key is an example of a toggle.

A toggle key is like a pushbutton switch. Push it once for on. Push it again for off.



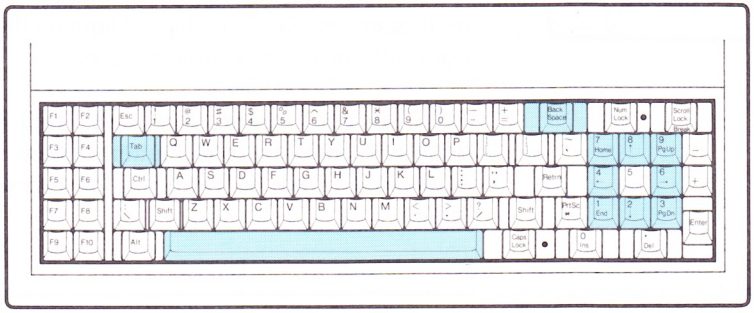
The **Tab** key is used to tab forward (move forward to the next tab stop). Press it while holding down the **Shift** key to tab back.

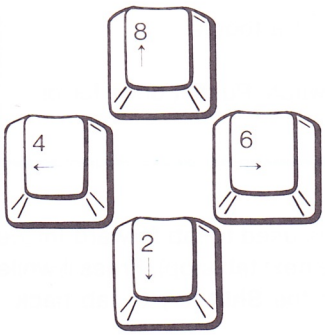
NOTE:

The **Tab** key should work about the same no matter what software system you are operating under.

If you have the DOS software loaded, try using the **Tab** key. It will move the cursor ahead to the next default tab stop. Press it again and it will move forward again to the next tab stop. Press it while holding down the **Shift** key to move the cursor back to the last tab stop.

Cursor Control Keys





The four arrow keys are used to move the *cursor* around on the screen. Each press of an arrow key moves the cursor one character position to the left or right, or one line up or down.

DEFINITION: Cursor

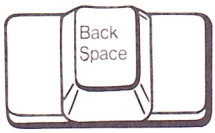
The cursor is a marker which indicates where on the screen the next typed character will appear. The cursor position is indicated by a flashing underscore mark.

Look at the number keys at the right side of the keyboard. You will notice that all of them except the **5** key have two different symbols printed on them. This is because the keys have two different functions. For example, the number **7** key also says **Home** below the number. Pressing the **7/Home** key will normally send the cursor to the home position on the screen (the upper left corner), but if you first press the **Num Lock** key, pressing the **7/Home** key will now enter the number 7. The number **7** is an alternate function of the **Home** key. The arrows, **End, Pg Up,** and **Pg Dn** are the alternate functions of the other number keys in this keypad area.

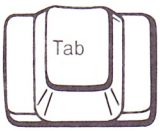
The **Num Lock** key (like the **Caps Lock** key) is a toggle key; that is, if you press it again it will revert to the first setting and the **Home** key again becomes active. Like the **Caps Lock** key, there is a small red light on the **Num Lock** key to indicate when it is active.

The **Home** key is the alternate function of the number **7** key. This key is used to move the cursor to the top left corner of the screen.

The **End** key is the alternate function of the number **1** key. This key is used to move the cursor to the lower left corner of the screen.

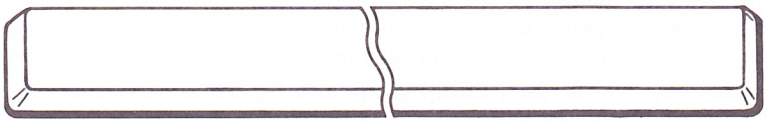


The **Back Space** key is used to move the cursor back one space. With some software control systems, using this key will erase any character the cursor passes over.



The **Tab** key moves the cursor forward to the next tab stop position.

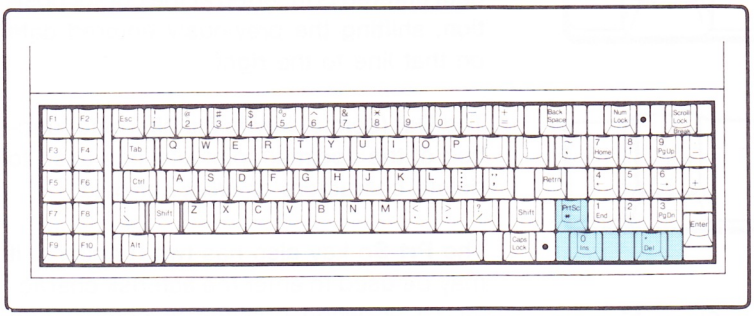
The cursor can also be moved to the right with the space bar. However, with some software systems, the space bar erases any characters the cursor passes over.



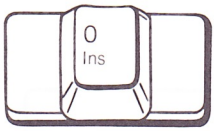
The **Pg Up** key is the alternate function of the number **9** key. It is often used to view the previous block of data.

The **Pg Dn** key is the alternate function of the number **3** key. The opposite of **Pg Up**, it's used to *scroll* forward.

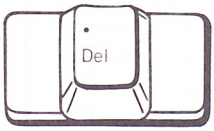
Editing Keys



The editing keys are used with a software package to alter text on the screen and manipulate the screen format. With them you can specify how characters displayed on the screen will appear and how you want them stored for later display or printing.



The **Ins** (insert) key is used by some software systems to enter *insert mode*; that is, data entered is inserted at the cursor position, shifting the previously entered data on that line to the right.

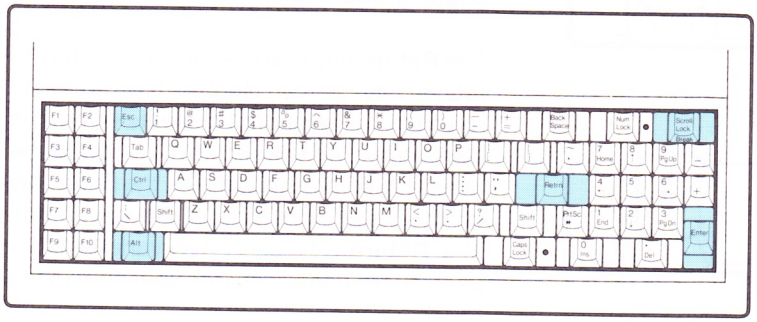


The **Del** (delete) key is the alternate function of the decimal point key. It is used to delete characters or *blocks* of data.

The **Prt Sc** key also has two functions. It may be used to enter the asterisk character (*) or, when pressed in combination with the **Shift** key, it can be used with some software systems to print the screen display on an attached printer.

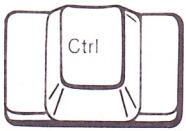
When **PrtSc** is pressed in combination with the **Ctrl** key, characters entered thereafter are immediately printed by the printer (until the **Ctrl** and **PrtSc** keys are pressed again).

Special Function Keys

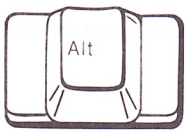


The special function keys are used to control some special functions of the computer. They are operational at all times, but have different uses depending on what software package is being used. Following are some typical uses.

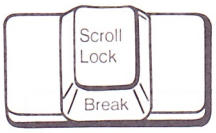
The **Esc** (escape) key has varying uses, but often is used to "escape" from a special *mode* and return to the normal mode of operation.



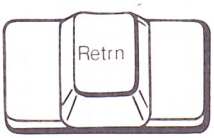
The **Ctrl** (control) key is always used in combination with another key. Press the **Ctrl** key and hold it down while pressing another key to activate a special function of that key.



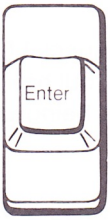
The **Alt** key is used only for special functions of software systems (for example, when using BASIC). As with the **Ctrl** key, it is used in combination with another key.



The **Scroll Lock/Break** key is used in combination with the **Ctrl** key to stop an ongoing operation.



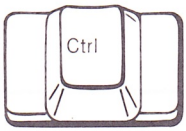
The **Return** key is sometimes used like the return key on an electric typewriter, to return to the beginning of the next line. It is also often used to indicate the end of a line of data to enter (the same as the **Enter** key on the lower right side of the keyboard). The **Return** key can have various other uses, depending on the software being used.

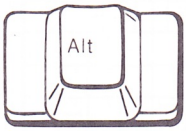


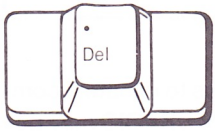
Most software systems ask you to respond to questions. The **Return** key or the **Enter** key can often be pressed as a default answer to the question (usually the most often used answer, such as the response of NO to a question asking if you want to use a special system).

NOTE:

Many software systems guide you through a series of choices by asking you questions or by presenting a *menu* — a list of choices. By pressing the **Return** or **Enter** key to select the default option, you can quickly respond to a long series of choices.

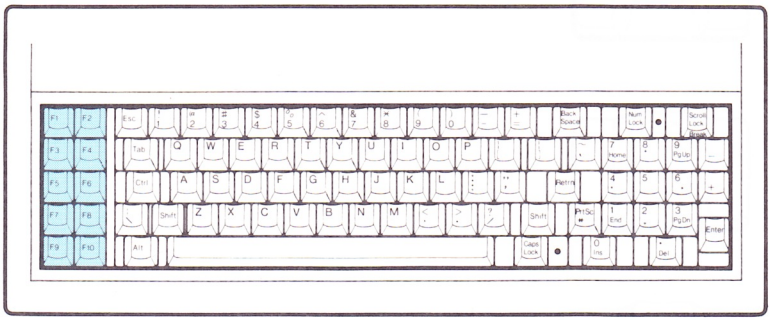






These three keys are pressed in this order and held down to reset the system.

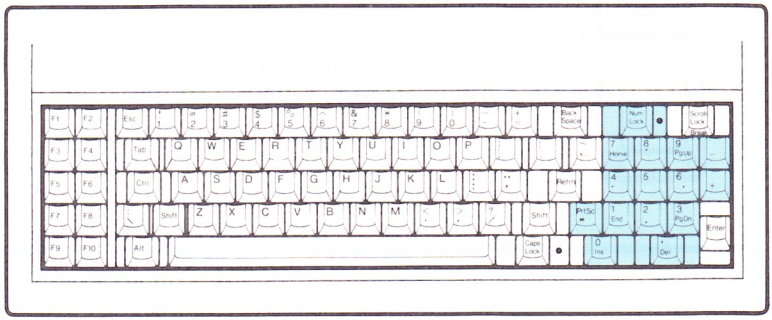
Program Function Keys



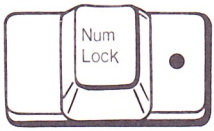
These keys are used by various software packages to initiate a complicated command with one keystroke. For example, BASIC may use the F1 key to LIST the program lines in the currently active program, and the F2 key to RUN the currently active program.

For more specific examples of how the DOS or BASIC system uses these keys, refer to the appropriate user's guide.

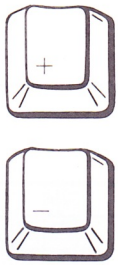
Numeric Keypad



The group of number keys (and related function keys) on the right side of the keyboard is called the "numeric keypad." Numbers entered here are treated by the computer just like the numbers along the top row of the typewriter keys. But it is often easier to use this group of keys, especially when you are entering several numbers in sequence.



The **Num Lock** (number lock) key is used to "lock in" the number keys. When pressed (the red light on the right side of the key should come on) this key activates the numeric function of the numeric keys just below it.



The plus sign key enters a plus sign. The plus sign is often used by software systems to indicate addition.

The minus sign key enters a minus sign. It is often used to indicate subtraction.

NOTE:

Software systems also often use the asterisk (*) to indicate multiplication. For that reason, there is an asterisk key to the lower left of the numbers. The slash mark (at the lower right of the typewriter keys) is often used to indicate division, and the period (alternate function of the **Del** key) is often used to indicate a decimal point.

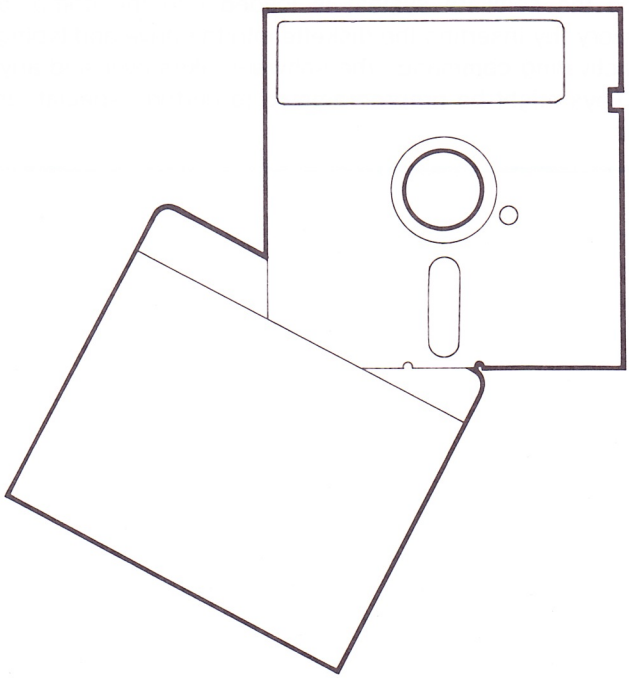
NOTE:

In addition to the functions described in this section, many software systems use various keys to perform special functions. These systems may ask you to hold down one key (usually the **Ctrl** key) while pressing another key. For example, the **Ctrl** key plus the **Q** key might be used by a software system to QUIT a special operation. Or the **Ctrl** key plus the **PrtSc** key might be used to activate a printer.

Once the software system is loaded into the computer's memory (by inserting the diskette into the drive and typing in an activating command), the software takes over and any of the keys might be preprogrammed to perform special functions.

Diskettes and Diskette Drives

Even though the system unit is the main control unit of your personal computer, it can do very little without some software to tell it what to do. The software you will use to control your computer is stored on 5¼-inch diskettes. You load the software by inserting the diskette into the diskette drive and typing in a code to activate it. (In some cases – for example, when using the DOS software – you just insert the diskette into the default drive and turn the system unit on. The DOS software will automatically be activated.)



But diskettes are not just used for loading software systems. They can also be used to store data.

DEFINITION: Read/Write

Computer systems are said to "read" from storage or "write" to storage. The computer can read data into its internal memory. It can also write a magnetically coded version of your working files onto a diskette for later retrieval.

Diskettes are commonly used to store your programs or files. (You have to store whatever you have been working on before you turn off the computer or it will be lost.) Often you will need to store what you have been working on and load a different file into the system. Therefore, you should think of diskettes as *input/output* (I/O) devices. They can be used to "input" data into the system (either software or files you have previously stored), and they can be used to "output" data, to store your current work until you are ready to use it again.

Be careful with your diskettes. Any damage to a diskette can mean the loss of the data stored on it (not to mention the loss of all the time it took to type in the data originally). When you handle diskettes, never touch the shiny disk surface. Most of the recording surface of the diskette is protected inside the square paper jacket.

Never bend the diskette or write on the jacket with anything other than a felt-tipped pen.

Be careful not to expose your diskettes to heat or extreme cold, or to a magnetic source.

Diskettes

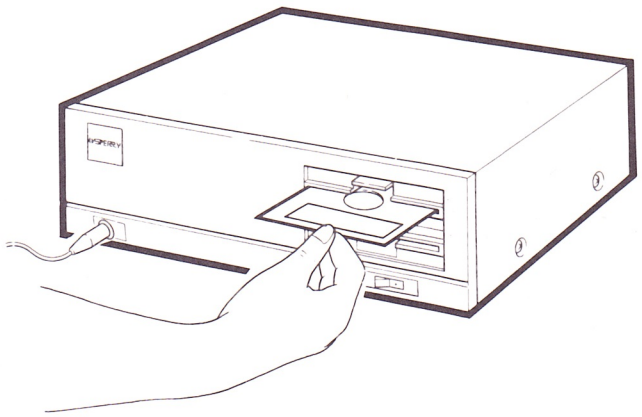
It is best to make a backup copy of your diskettes every once in a while. Always make copies of your software control diskettes BEFORE YOU USE THEM. Then, if they are damaged in any way, you can make a new working copy from the original. Keep your originals in a safe, temperature-controlled area. Chapter 4 tells you how to make copies of your diskettes.

Some diskettes should be *write-protected*; that is, protected in such a way as to keep the computer from writing over files in case you give a write command that you didn't intend. This is done simply by putting a piece of tape over the notch found on the upper right edge of the diskette. Some control diskettes don't have any notch at all, so they are already write-protected. If you want to change something on a write-protected diskette, or if you want to erase something, you first have to remove the tape over the notch.

Inserting Diskettes

Make sure the drive door is completely unlocked before you try to insert the diskette (the release lever should be all the way up). Most people hold the diskette between the thumb and first finger as shown in the illustration below. Push the diskette straight into the slot, feeling for any resistance as you push. Make sure the diskette is all the way in before you try to lock the drive door.

If the diskette won't go in smoothly, never use force. Pull it back out and see what is obstructing its path. It could be that another diskette is already in the drive. Sometimes labels can come loose from a diskette and get caught in the diskette path. You might need a portable light of some kind to get a clear look into the drive path.



When the diskette is in as far as it will go, you should hear a click. Then push the lever down, and again you should hear a click as the drive door locks. This click is the best indication that the diskette has been inserted properly. If you don't hear the click, press in on the center of the door to open it and try inserting the diskette again. Never try to force the door closed.

Maintenance

The diskette drives in your system unit should provide trouble-free service. But a little care in using the drives never hurts.

You should clean your diskette drives every 200 operating hours. There are several types of diskette drive head cleaners available. They all include a cleaning diskette. Be sure to follow the instructions on the cleaning diskette package. Some of these products include a cleaning fluid that you put on the cleaning diskette. Use this cleaning fluid only according to the directions on the cleaner's package.

Insert the cleaning diskette in the drive. As the system attempts to read the diskette, the heads are gently cleaned.

Fixed Disk

If your system has a fixed disk drive, you may use it much like a second diskette drive. The DOS system treats both types of disks the same. The main difference is that the fixed disk has a much greater storage capacity and is much faster than a flexible diskette. This makes it very convenient to work with. You can copy all the programs you need, including DOS system files, BASIC, and any specialized programs you have, such as word processing or spreadsheet programs, onto the fixed disk. You will still have plenty of room for work files and data storage files.

Before you use the fixed disk, it must be prepared for use by DOS. These procedures are in Chapter 4. If the proper steps are not taken, the following error message appears:

```
Invalid drive specification
```

Fixed disk drives are referred to in the same way as diskette drives. You use a disk drive specifier when you want to read from or write to a fixed disk. Whether your system has one or two diskette drives, DOS assigns the letter C to the first fixed disk drive. If there is a second fixed disk drive, DOS assigns it the letter D.

You should keep backup copies of everything on your fixed disk, just as you do with diskettes. Keep your original software diskettes in a safe place, in case something happens to the information on the fixed disk.

You should also make backup copies of all data files on the fixed disk. You can copy individual files to diskettes using the COPY command.

Or, to back up everything on the fixed disk at once, use the BACKUP command. Have a supply of blank, formatted diskettes available. The system will tell you to insert a new diskette as each diskette becomes full. For more information on the BACKUP command, refer to the *Guide to DOS 2.11*.

Peripherals

Peripherals is a term used to describe other hardware devices, such as printers, that you attach to your system unit.

If you want to add peripherals to your system, you must first find out exactly what devices will work properly with your particular PC. Refer to the installation and operating information that should be included in your peripheral device package.

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Chapter 4. Introduction to DOS

Introduction

The most important software for any computer system is its *operating system*. On small computers, the operating system is usually not built into the computer, but is read into the computer's memory from a diskette or fixed disk. That is why it is called a "disk" operating system (usually shortened to DOS).

Although there are several disk operating systems that can be used with the SPERRY Personal Computer, the one included with your computer is MS-DOS. It is one of the most popular operating systems and it is one of the easiest to use.

A diskette with all of the MS-DOS control files is included with your personal computer. Be sure your DOS diskette is write-protected. (Refer to "Diskettes and Diskette Drives," in Chapter 3.) This chapter will tell you how to make a backup copy of the DOS diskette.

This chapter is not intended to be a complete explanation of DOS, but is designed only to acquaint you with the most commonly used DOS commands. Special attention is paid to the procedures for copying diskettes and for diskette file handling. For more complete information about DOS, refer to the SPERRY Personal Computer *Guide to DOS 2.11*.

Introduction to DOS

DEFINITION: Operating System

An *operating system* is a series of commands and instructions that tell the computer how to handle incoming information, how and where to store files, how to display information on the screen, and all the other aspects of computer operation.

The concept of an operating system is sometimes difficult for people not used to working with computers. They expect the operating system to be built in, and in fact, on computers with large memory storage areas, it is. But small computers can be used for many purposes, and for each purpose a different operating system might be most valuable.

The SPERRY Personal Computer should be tailored to your needs; therefore, you should select the type of operating system that best fits your needs. A general-purpose operating system comes with your computer, recorded on the DOS diskette. You "load" the disk operating system (DOS) into the computer's memory by inserting the DOS diskette. The computer will "read" it and take over from there.

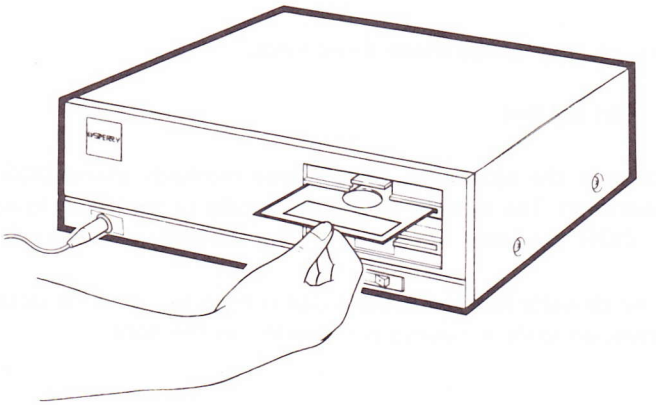
Loading DOS

The DOS software that came with your computer must be loaded before you can go to work. Once the DOS software is loaded into your system, it tells your computer everything it needs to know in order to operate. It redefines many of the keys on the keyboard so that they may be used for special functions. DOS also has several files that are loaded into the computer's memory. These control files are used for special file handling operations. We will look at some examples of these control files after the disk operating system is loaded.

First, you have to load the DOS software.

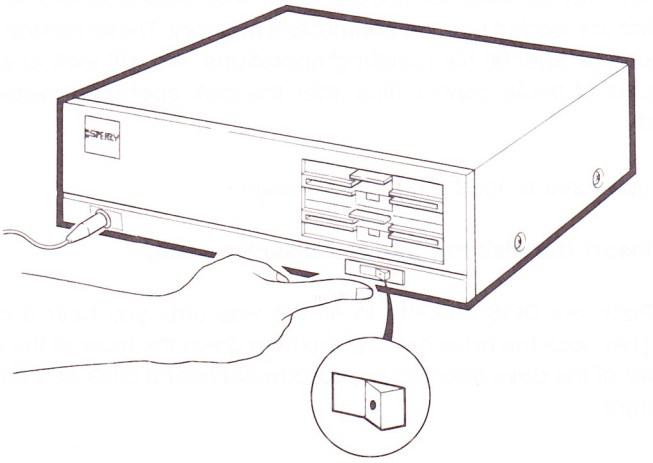
1. **Insert the diskette into the diskette drive.**

   Push the DOS diskette in all the way until you hear a click. Then lock the drive door by pushing down the lever at the center of the drive door. Again, you should hear a click as it closes tight.



2. Turn the system on.

The power switch is just below the diskette drives. Push the switch to the on position, or if the system is already on, turn it off and then back on again.



Or, you can press these three keys:

Ctrl Alt Del

to reset the system. Each of these methods starts DOS in operation. The system will automatically begin trying to read a DOS diskette in drive A, the default diskette drive.

If no diskette that the system can read is found in the default drive, an error message will appear on the screen.

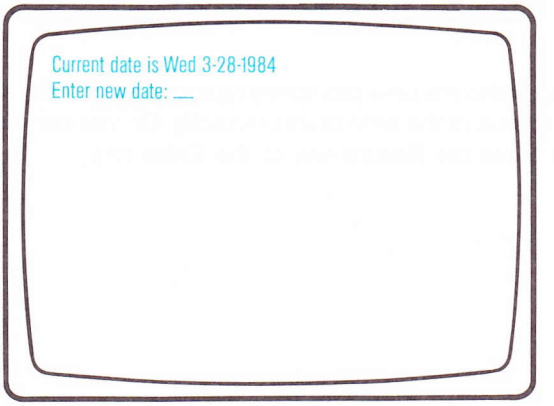
If you have a fixed disk, the system will try first to read a system diskette in drive A. If there is no system diskette in the drive, the system will then look on the fixed disk for the DOS files. To load DOS from the fixed disk, leave the diskette drive door open and the system will go to the fixed disk when the system is started.

NOTE:

If you want to load DOS from the fixed disk, copy your DOS files to the fixed disk, using the procedures in "Preparing Your Fixed Disk" and "Copying Diskettes to the Fixed Disk." The same prompts appear, whether you load DOS from the disk or a diskette.

3. Respond to the date and time prompts.

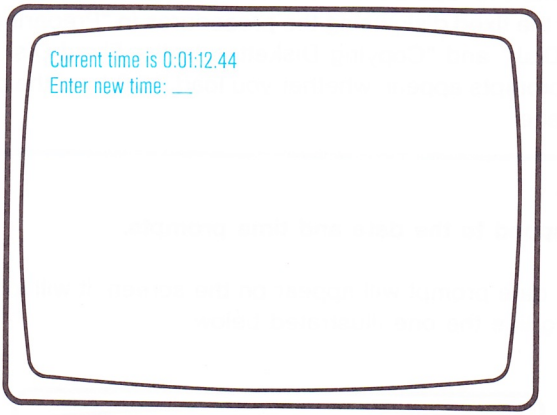
The date prompt will appear on the screen. It will look something like the one illustrated below.



You can now enter the date, using the same format as the date already on the screen. The system will automatically check to see if the date has been entered correctly and will display an error message if it has not.

If you don't want to change the date, just press the **Return** or **Enter** key to skip over it.

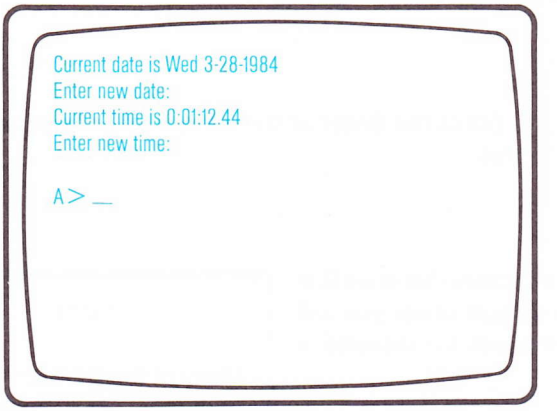
If the date is entered correctly, the screen will change to look something like the one below.



Respond to the time prompt by typing in the correct time. Copy the format of the time prompt exactly. Or, you can skip over it; just press the **Return** key or the **Enter** key.

4. Begin working with DOS.

Now, if all went as expected, you are working with the DOS software. The screen should look like the example below.



The letter A with the greater than sign (>) next to it is the DOS *prompt*. Whenever you see it on the screen, it means the DOS system is loaded and ready for a DOS command.

If other software is loaded, a different prompt will appear. (For example, when BASIC is in operation, the prompt "Ok" replaces the A>.)

The A> also indicates that you are working with the diskette in drive A. You can change the default drive by entering the name of the other drive. If you are using drive A and you want to change to drive B, just type B (followed by a colon).

The screen should look like this:

```
A>B:
```

Then, if you press the **Enter** or the **Return** key, the prompt should change to this:

```
B>
```

The B> indicates that drive B is now the default drive; you will be working with the diskette in drive B.

You can change back to drive A simply by typing the letter A next to the B> prompt. It will change back to A> and you will again be working with the diskette in drive A.

NOTE:

Many of the DOS commands (called *internal* commands) are now stored in your personal computer's main memory area and are available to the PC system at any time (even if the DOS diskette is not in the drive). However, *external* DOS commands tell the computer to look for instructions on the DOS diskette. If you change the default drive to drive B, but don't move the DOS diskette, the computer will look there for those instructions and won't be able to find them. They are on your main DOS diskette in drive A.

Copying Files and Disks

Before using the DOS diskette, you should make a backup copy of it. Then, in order to protect your main DOS diskette, you should use only the backup copy.

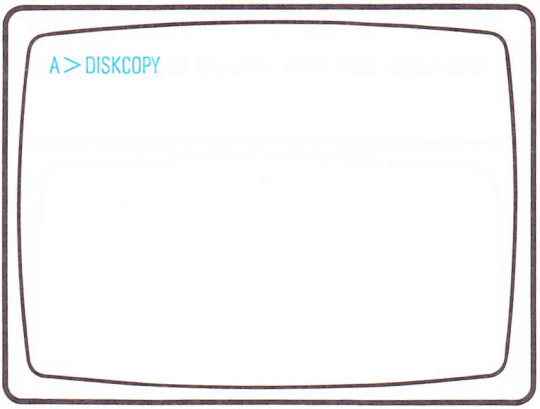
Although there are several ways to copy files from one diskette to another, the easiest method is to use the diskette copying command in the DOS software, DISKCOPY.

Making a Backup Diskette With One Drive

If you have one diskette drive in your system unit, use the following instructions. If you have two diskette drives, turn to the next section ("Making a Backup Diskette With Two Drives").

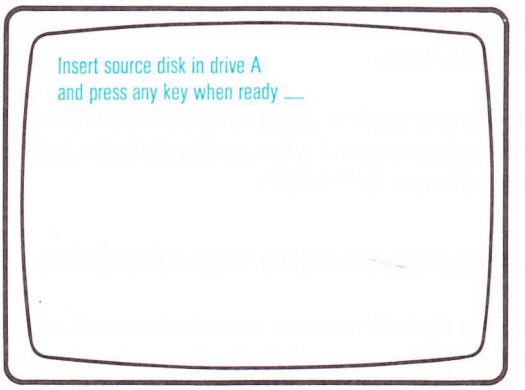
1. Insert the DOS diskette in drive A.

2. Type DISKCOPY right after the A>prompt:



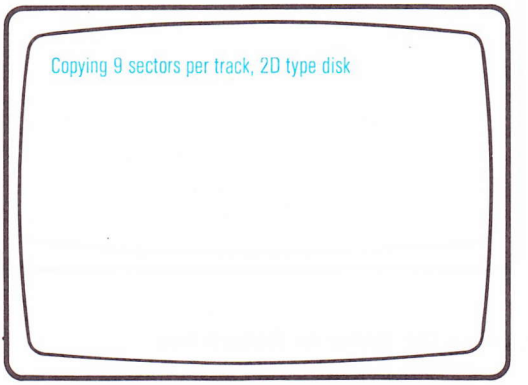
Now, press the **Enter** or **Return** key.

This message should be displayed on the screen:



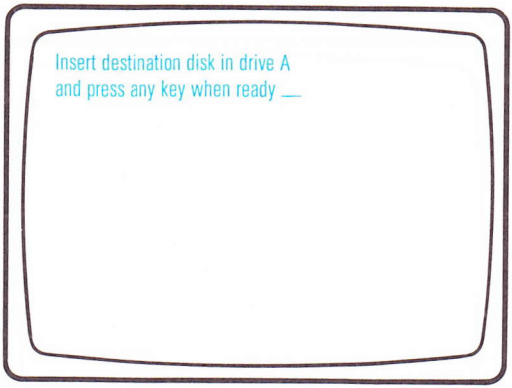
This message means that the system is waiting for you to put the source diskette (the diskette to be copied) into the drive. Since the DOS diskette should already be in the drive, and since that is the diskette you want to copy, all you have to do is press the space bar (or any key).

3. Next, a message like this should be displayed:



The red light on the diskette drive door will stay on until the copying process is complete.

Then the system will present this message:



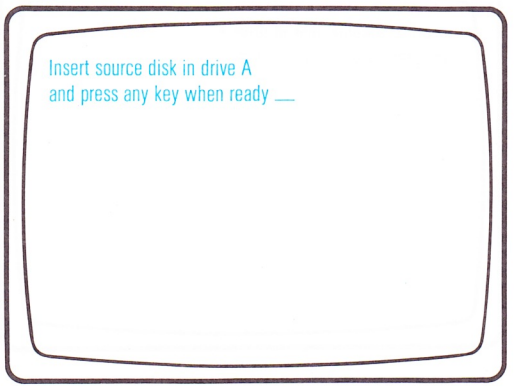
This means that the system has stored the contents of that diskette in its memory and will copy those contents onto another diskette as soon as you put a new one in the drive.

4. Put the new diskette into the drive and press the space bar (or any key). The system will begin making an exact copy of the DOS diskette, and will display the message "Formatting while copying."

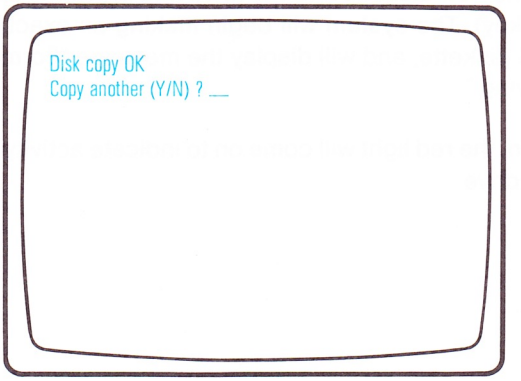
Again, the red light will come on to indicate activity in the diskette drive.

Backup With One Drive

If the diskette being copied contains a large amount of information, the system may not be able to finish the complete copy in one pass. If this is the case, it will again ask you to insert the source diskette (the DOS diskette) into the drive. It will display the same message as before:



When the copying process is complete, the screen will display something like:



5. The next line on the screen asks you if you want to make another copy. If you want the system to make another copy, you can type Y (for Yes). The system will begin the process over again, asking you to insert the diskette to be copied and then the new one to copy to.

6. When you are finished making copies, respond to the (Y/N) prompt with N (for No); the screen will be cleared and the A>prompt will again appear.

Now you have an exact copy of the DOS control diskette. Put the original DOS diskette away in a safe place. (To protect your original DOS diskette from being accidentally overwritten, place a piece of tape over the write-protect notch.) It should not be necessary to restart the system.

Backup With Two Drives

Making a Backup Diskette With Two Drives

1. Insert the DOS diskette in drive A.

2. Type

   DISKCOPY

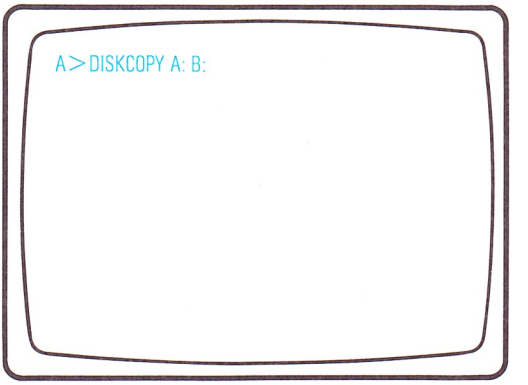
   right after the A>prompt. Leave one space. Next, enter

   A:

   (the drive where the diskette to be copied is). Leave one space. Next, enter

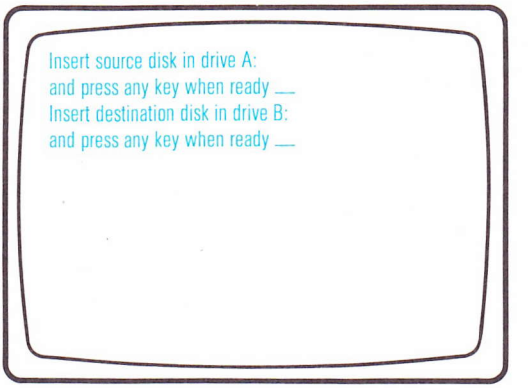
   B:

   (the drive where the new diskette to be copied to is located). The screen should look like this:



   Press the **Enter** or **Return** key.

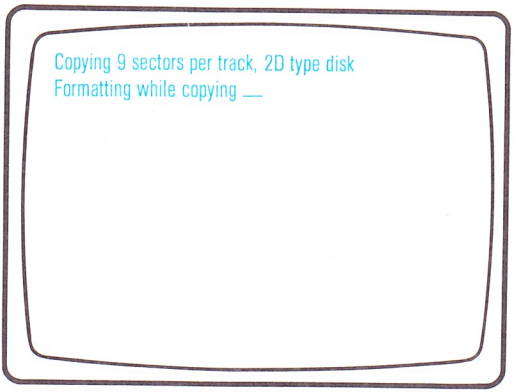
The system will respond with



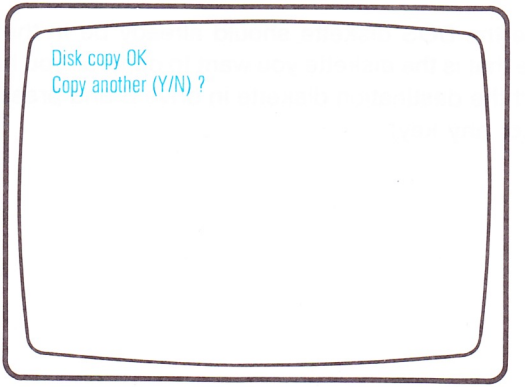
This means that the system is waiting for you to put the source diskette (the diskette to be copied) and the destination diskette (the diskette to be copied to) in the drives.

3. Since the DOS diskette should already be in the drive, and since that is the diskette you want to copy, all you have to do is insert the destination diskette in drive B and press the space bar (or any key).

The system will display a message similar to this:



When the copying process is complete, the screen will display something like



4. This message is asking you if you want to make another copy. If you want the system to make another copy, you can type Y (for Yes). The system will begin the process over again, asking you to insert the diskette to be copied and then the new one to copy to.

5. When you are finished making copies, respond to the (Y/N) prompt with N (for No). The screen will be cleared and the A> prompt will again appear.

Now you have an exact copy of the DOS control diskette. Remove the original DOS diskette from drive A and put it away in a safe place. To protect your original DOS diskette from being accidentally overwritten, place a piece of tape over the write-protect notch. Take your new diskette out of drive B and insert it in drive A. It should not be necessary to restart the system.

When making a copy of a diskette with the DISKCOPY command, remember that all of the contents of the diskette will be copied onto the new diskette. If there is any existing data on the destination diskette, it will be destroyed when it is copied to. For this reason, make sure that you are using a blank diskette or a diskette which does not contain any valuable information when using the DISKCOPY command.

When you wish to copy files onto a diskette that already contains information, you should use the COPY command. This command does not destroy the information already on the destination diskette. But when you use the COPY command on a new diskette, the diskette must be formatted before it can accept your files. (DISKCOPY automatically formats as it is copying, but the COPY command does not.) Formatting diskettes and copying files are discussed in the next sections.

Formatting New Diskettes

Before you use a new diskette, you must prepare or *format* the diskette first, unless you are copying from another diskette using the DISKCOPY command, as previously described.

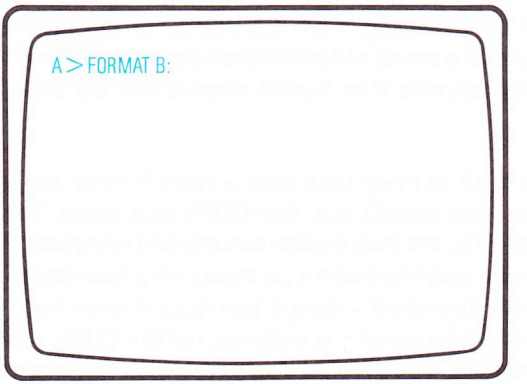
The FORMAT command can also be used to erase a diskette that has information you no longer need.

To format a diskette:

1. Insert the DOS diskette in the default drive (the top drive if you have more than one).

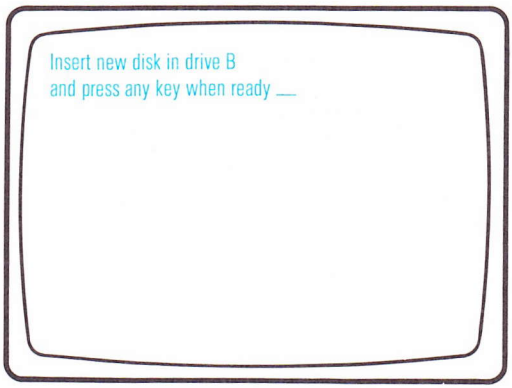
2. Load the DOS system.

3. When the A> prompt appears on the screen, type FORMAT B: right after the A> prompt:



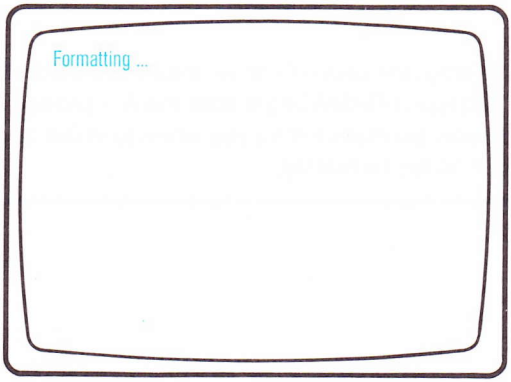
Then press the **Enter** or **Return** key.

The system should respond with a message something like this:

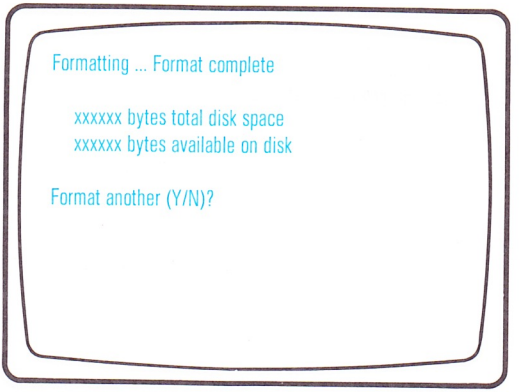


4. Insert the new diskette in drive B. Press the space bar (or any key) to start the formatting process. The red light in the drive door should come on as the system clears the diskette and sets the format to DOS specifications.

While the system is doing this, it will display



When the process is finished, the system will display a message similar to the following:



Press the N key (for no) unless you want to format another diskette.

The formatted diskette has no data on it, but it has been prepared to accept data using the DOS format.

NOTE:

If you have only one diskette drive, insert the DOS diskette in the drive and type FORMAT right after the A> prompt. The system will display prompts telling you when to insert and remove the diskette to be formatted.

Copying Files

You may want to copy some of the individual files from the DOS diskette to your other working diskettes or to the same diskette.

For example, you may want to copy all of the BASIC files onto another diskette. You *cannot* use the DISKCOPY command because DISKCOPY erases everything from the new diskette before it copies the original diskette. You have to use the COPY command. The COPY command is used to copy specific files from one diskette to another. (Remember that a new diskette must be formatted before it can receive the copy.) For example, if you type

```
COPY SAMPLES.BAS B:
```

next to the A> prompt and press the **Return** key, it tells the system to copy the file named SAMPLES.BAS from the diskette in the default drive (drive A) to the diskette in drive B. The system will immediately begin to read that file and then it will transfer an exact copy of that file (with the same name) to the next available space on the diskette in drive B.

If you have a fixed disk, insert the diskette containing the files to be copied in the drive. Enter:

```
COPY SAMPLES.BAS C:
```

to copy a file named SAMPLES.BAS from the diskette in the drive to the fixed disk (drive C). (Refer to "Using the Fixed Disk" for the fixed disk preparation and formatting procedures.)

The system will display a message similar to the following when it has finished copying:

```
1 file(s) copied
```

The system will not erase anything from either diskette, even if there is not enough room on the diskette being copied to. If there isn't enough room, they system *will not* make the copy and will display a message similar to the following:

```
Insufficient disk space
0 file(s) copied
```

If you want another copy of a file on the same diskette, you must give the copy a different name. Otherwise, the original file will simply overwrite itself. For example, if you type

```
COPY SAMPLES.BAS TRYOUTS.BAS
```

next to the A> prompt and press the **Return** key, it tells the system to create a duplicate of the file SAMPLES.BAS on drive A, and give it the name TRYOUTS.BAS.

In summary, it is recommended that you make working copies of *all* your original software diskettes using the DISKCOPY command. This command tells the system to make an exact copy of the entire diskette. Then, when you want to copy a single file, or groups of files, to a backup diskette, you should use the COPY command.

Using the Fixed Disk

The fixed disk can be divided into as many as four separate areas called *partitions*. Partitions can be of different sizes. They are created with FDISK, the fixed disk preparation program provided by DOS.

A partition on the fixed disk can be designated as the *startup partition*. This means that the system will load with the operating system in that partition, if the diskette drive door is left open.

Preparing Your Fixed Disk

The DOS fixed disk preparation program (FDISK) can be used to create, change, or erase the DOS partition. (A partition for use by another operating system can be created, changed, or erased only by using that operating system's fixed disk preparation program.)

You can create one DOS partition on a fixed disk at the location and of the size you choose. You can also erase the DOS partition if, for example, you want to create it again with a different size or at a different location on the disk. If this is the case, you might want to use the BACKUP command to back up your files in your DOS partition first.

Preparing Fixed Disk

The following functions are supported by the DOS fixed disk preparation program (FDISK):

1. Creating the DOS partition.
2. Changing the startup partition (the one that will take control when the system is started).
3. Erasing the DOS partition.
4. Displaying fixed disk partition information.
5. Selecting the next fixed disk drive.
6. Selecting the prior fixed disk drive.

These functions are listed in the FDISK menu. The procedures for each function are described in the *Guide to DOS 2.11*.

Start the FDISK program as follows:

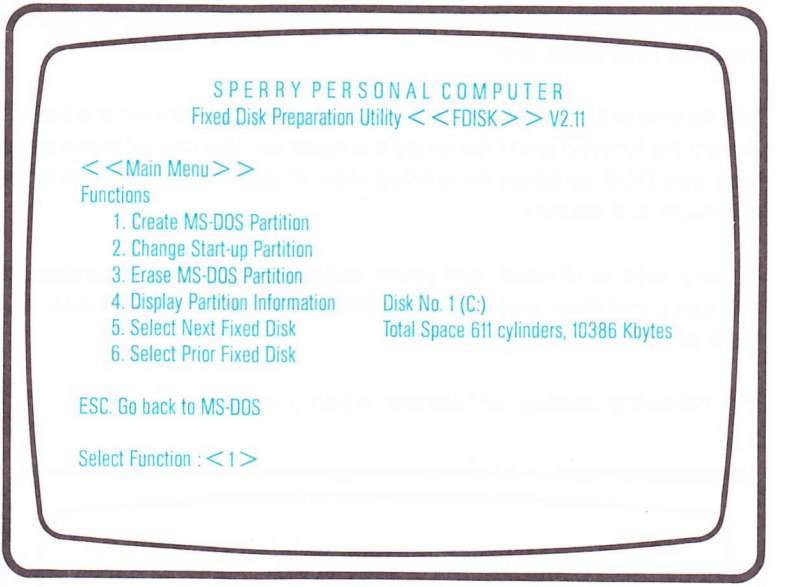
Type:

```
d:FDISK
```

where d: is the drive where the FDISK program resides. If FDISK is on the default drive, just type:

```
FDISK
```

Press the **Enter** key. The following menu will appear:



Type the number of the option you want and press the **Enter** key. Option 1 is the default and will be selected automatically if you don't type an option number before pressing the **Enter** key.

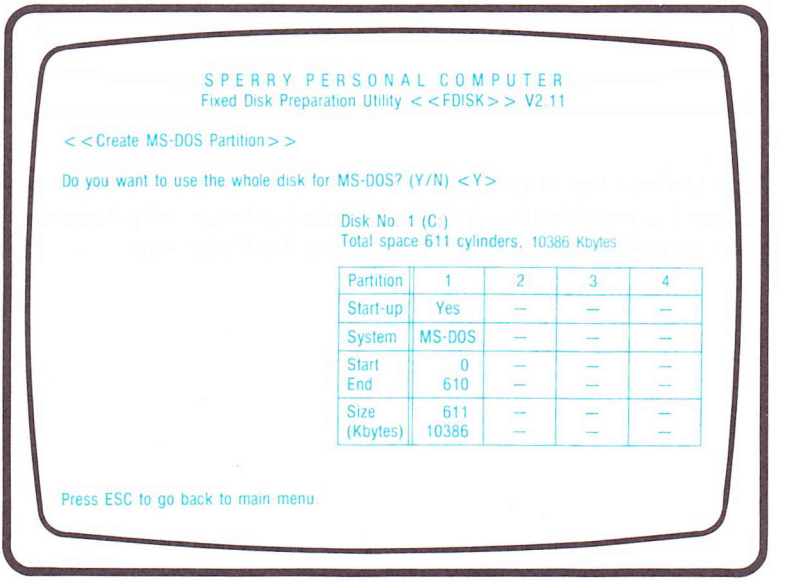
Creating a DOS Partition

FDISK will allow you to create a startup partition on any fixed disk. However, DOS (or any other operating system) can only be started from the first fixed disk.

Before you create a DOS partition, you need to determine where it should be located and how large it should be. You can't create more than one DOS partition on a fixed disk. If you try to do so, an error message will appear.

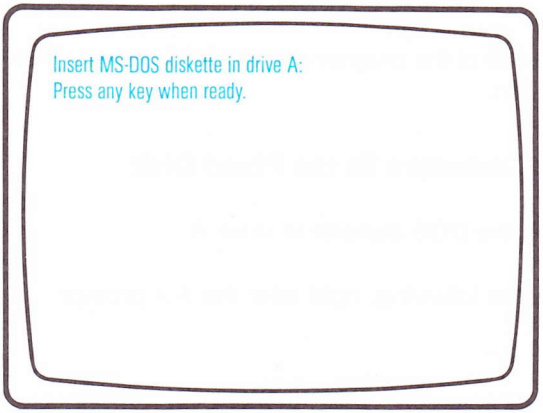
A fixed disk is divided into parts called *cylinders*. The number of cylinders and their sizes can vary depending on the fixed disk you have attached to your computer.

The following display will appear when you select Option 1:



1. If DOS is the only operating system that you intend to use with the fixed disk, press **Enter** to accept the default response.

   FDISK will then create the DOS partition. The following message will appear:



2. With your DOS diskette in drive A, press any key to restart DOS. DOS will then recognize your fixed disk and assign a drive letter to it.

The DOS partition has now been created on your fixed disk, but before DOS can use it, you need to create a directory and other information in the partition. To do this, use the FORMAT command. For example:

At the system prompt (A>), type

```
FORMAT C:/S
```

This formats the DOS partition you have just created. At the same time, the DOS system files are copied onto the DOS partition.

If you copy DOS to this fixed disk, you should also copy all the programs on the DOS diskette to this fixed disk. Use the COPY command to do this. For example:

At the system prompt (A>), type

```
COPY *.* C:
```

This copies all of the programs in the DOS diskette directory to the DOS partition.

Copying Diskettes To the Fixed Disk

1. Insert the DOS diskette in drive A.

2. Type the following, right after the A> prompt:

   ```
   A>COPY *.* C:
   ```

3. Press the **Enter** or **Return** key. This command directs DOS to copy the contents of the diskette in drive A to drive C, the fixed disk drive.

   When the copying process is complete, the system will display the number of files copied.

4. Place a piece of tape over the write-protect notch on the DOS diskette. Keep it in a safe place, in case something happens to the information on the fixed disk. You can now load the DOS system from the fixed disk.

   Open the diskette drive door and turn the system on. After a few moments the date and time prompts will appear. The fixed disk drive (C) is the default drive.

DOS Commands

To work with your PC, you need to begin by using one of the standard DOS commands. All of the DOS commands are described in the *Guide to DOS 2.11*.

To get you started, here are a few of the most commonly used commands:

DIR	Displays a *directory*, or listing, of all the files currently stored on the diskette.
COPY	Copies entire files from one diskette to another.
DISKCOPY	Copies all the files on one diskette to a different diskette.
CHKDSK	Checks the current status of a diskette, including how many files are currently on a diskette and how much memory is currently in use.
TYPE	Displays the contents of a file.
RENAME	Changes the name of a file.
DELETE	Erases a file completely from the diskette. Be careful with this command.
FORMAT	Prepares a diskette to store DOS formatted files. Be careful with this command; as part of the formatting, it erases everything on the diskette.

To use these commands, simply type the command next to the DOS prompt (A>).

Command Practice

If the DOS prompt is on the screen, you can enter a command. Try one of the easy commands, like DIR. Just type

```
DIR
```

right after the A> and press either **Enter** or **Return**. You can type the command in either uppercase or in lowercase. Don't leave any spaces. The screen should look like this:

```
A>DIR
```

Now, after you press the **Enter** key or the **Return** key, the system will display a listing of all the files currently stored on the diskette in the default drive. (The default drive is indicated by the letter in the prompt: A for the top drive, B for the bottom drive.)

If your DOS control diskette is still in the default drive, the system will display a listing of all the DOS control files stored on that diskette.

Now enter the TIME command. The system will display the same type of time prompt that you saw when you first loaded the DOS software. You can pass over it and go back to the DOS prompt by pressing the **Enter** or **Return** key.

You can try some of the other commands, but many require information besides the command name. Refer to the *Guide to DOS 2.11*.

DOS Files

Information stored on diskettes or on the fixed disk using the DOS system is stored in *files*. A file can either be a *program* file (used to control the computer) or a *document* file (used to store data). Both kinds of files are managed using the DOS file handling commands.

Files can be created using the EDLIN line editing system, which is started by entering the EDLIN command. (Refer to the *Guide to DOS 2.11* for a complete description of EDLIN.)

Document files are often created and maintained using text editing software. If you are using such software, refer to the user's guide for that system, paying special attention to instructions that refer to the DOS controls.

File Handling

To use a DOS file handling command, you give the system the following information:

- DOS command
- Filename (with the extension if it has one)
- Address (the drive the diskette is in)
- File codes (special codes to instruct DOS)

For example:

DIR	**TEST.TSS**	**B:**	**/W**
DOS command	Filename (with extension)	File address	DOS code

Filenames

DOS files can have names up to eight characters long. An optional *extension* to the *filename* can have up to three characters. Filenames can be made up of any of the normal keyboard characters with the following few exceptions (these are *reserved* for special DOS uses):

*	Asterisk	?	Question mark
+	Plus sign	=	Equal sign
:	Colon	[ ]	Square brackets
;	Semicolon	\	Backslash
"	Quotation marks	{ }	Braces
,	Comma	|	Column separator
.	Period	< >	Angle brackets
/	Slash		

Any other characters can be used, in any combination, both for the main filename and for the extension.

Here are some examples:

tester	**growchrt**	**sg$.ts$**
test.tss	**&&3B.B!3**	**friday.one**
% % .777	**June**	**July.14$**

As you can see, there are a great number of possible combinations. Notice the period (for example, in the filename TEST.TSS). It is used to indicate the end of the main filename and the beginning of the extension.

Be careful not to leave spaces in the middle of filenames, like this:

sgl 44.tes **9% ofT** **no 3**

or use reserved characters, like this:

no3.1.bak **file8,9** **test:4.bas**

or create names that are too long, like this:

number123.bak **sched.four**
testingfile.sixty

The filename is usually the first thing entered next to the A> prompt. It must be entered exactly the way the file is named on the diskette. Otherwise DOS will return an error message.

If you can't remember the exact filename, you can always enter the DIR command and get a listing of everything stored on the diskette.

You may want to tell the system to look for a group of files. Maybe you want to get a directory listing of only the files for your stamp collection. Let's say you have named all your stamp collection files STAMP, and sometimes also a number or a color. For example:

stamp1	**stamp3.blu**	**stamp4.red**
stamp2	**stamp3.grn**	**stamp4.blu**
stamp2.red	**stamp3.red**	**stamp5**

These are all valid filenames.

There is a way to tell the system to look only at files beginning with the word STAMP.

It is done with what are known as *wild cards*. Wild cards take the place of characters in a filename, including in the extension. The symbol for a wild card to replace a character in a filename is the question mark (?). If you put it in the middle of the filename you are calling, it will take the place of any character or characters in that position of the name on the diskette. For example, if you wanted to find out if your stamp files were stored on a diskette, you would normally have to enter:

```
DIR stamp1
DIR stamp2
DIR stamp2.red
DIR stamp3.blu
DIR stamp3.grn
DIR stamp3.red
DIR stamp4.red
DIR stamp4.blu
DIR stamp5
```

After entering each of these commands and pressing the **Enter** or **Return** key, the system would list the files named (assuming you didn't make a mistake in entering all those names). But you could get them all listed at once by entering:

```
DIR stamp?.???
```

This command uses the question mark wild card to display from the directory all the files that begin with STAMP, have one unknown character after STAMP, and have up to three unknown characters in the extension.

The question mark can be used to replace any number of characters in a filename. If you wanted, you could enter eight question marks, a period, and three more question marks. This would tell the system to display all the files because it enters a wild card in place of every possible character.

But if you want to tell the system to look for an entire name, or the entire remaining portion of a name, there is an easier way.

The asterisk (*) can be used to replace the portion of a filename that comes before the extension, or it can be used to represent the extension itself. It is a quick way to signify a number of question marks. Using the stamp collection files again, we could have asked for a directory listing of the stamp files with the named extensions by entering:

```
DIR stamp*.*
```

This tells the system to look for all files that begin with the word STAMP, regardless of the extension. Notice that the * can be used to indicate any number of characters to finish the part of the filename before the extension. We could have achieved the same result by entering:

```
DIR sta*.*
```

In this case we would be telling the system to display a directory listing of all files that begin with the letters STA, regardless of how they end, before or after the period. This might display more than just the stamp files, but all the stamp files would be included.

You can use the wild card characters to be more specific, also. If you entered:

```
DIR *.blu
```

the system would look for any file with the extension BLU. To be even more specific, enter:

```
DIR stamp*.blu
```

and you will get only the stamp files with the extension BLU.

You may want to tell the system to take some action on all the files on a diskette. For example, you may want to copy all of them, or delete all of them. The wild card characters make this possible. For example, entering:

```
COPY *.* b:
```

copies all the files that are on the diskette in drive A to the diskette in drive B. This is a very useful command to transfer all the files from one diskette to another diskette that already has files stored on it.

File Addresses

A file's address refers to its diskette drive designation. If you are dealing with files that are on the diskette in the default drive, you can omit the file address designation. For example, entering

```
DIR A:
```

results in the same response from the system as if you entered

```
DIR
```

Either way, the system responds with a list of the contents of the diskette in drive A (the default drive), if the A> prompt is displayed on the screen.

But entering

```
DIR B:
```

displays a directory listing of the diskette in drive B. Since the system automatically looks in the default drive if no drive name is included in the DIR command, the address is said to be *optional.* In most software manuals, an optional part of a command is indicated by enclosing it in square brackets.

Therefore, the complete form of the DIR command

```
DIR [d:] [filename]
```

indicates that both the drive address and the filename are optional; the command will work with or without them. You only need to specify a drive address if it is not the default drive. The filename (with or without wild cards) is necessary only if you want to restrict the display to certain files.

File Codes

Some DOS commands require other file codes. The codes qualify the command, often specifying such things as memory storage addresses, output formatting, read/write instructions, etc. These codes are described in the *Guide to DOS 2.11.*

Command Practice

Earlier in this chapter, you had a chance to use the basic form of the DIR command. When you typed the command, the system responded with a listing of all the files stored on the diskette. Now you can use the command in its more complete form. If you enter the DIR command with the name of a file, only that file will be displayed. For example, try typing in

```
DIR COMMAND.COM
```

next to the A> prompt. The system should respond with:

```
COMMAND.COM 4847 3-05-82 1:37a
```

The control file COMMAND.COM should be on every DOS control diskette. If the DOS diskette is in the default drive, the complete listing of the COMMAND.COM file should appear on the screen. Make sure you have spelled it right and used exactly the same spacing.

Now, if you use the wild cards you can get the system to display logical groups of files. For example, if you type in

```
DIR *.COM
```

next to the A> prompt, the system will display all the DOS files that use the .COM extension. These are the command files that DOS uses. Try

```
DIR *.EXE
```

and

```
DIR *.BAS
```

to get a listing of all the EXE (executable) files and the BAS (BASIC) files that are on the DOS diskette.

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Chapter 5. Introduction to BASIC

This chapter gives you an overview of the BASIC software supplied with your SPERRY Personal Computer. It tells how to load BASIC and describes some of the commands. A *programming language* like BASIC is used to create programs to instruct the computer. These programs are stored as program files on your diskettes. This chapter describes how to create simple programs and how to store them and retrieve them from the diskette.

However, the version of BASIC included with your SPERRY Personal Computer includes far too many commands and functions to be fully described in this book. For more complete information on this expanded version of BASIC, refer to *Programming in BASIC*.

DEFINITION:
Programming Language

A programming language, like BASIC, is a set of commands which are the basis of programs that tell the computer what to do. These programs are actually a series of sequential steps, usually used to carry out a task that is sequential in nature. Alphabetizing is sequential, as are mathematical operations. *Programming* (writing such programs) is a skill that requires thinking of your computer tasks as a series of steps, often leading to the next task, which is often another series of steps.

Introduction to BASIC

The BASIC software provided for the SPERRY Personal Computer is a full-capability, expanded version of MS-BASIC. It is compatible with other versions of BASIC, but includes many more commands and functions.

BASIC can only operate if your MS-DOS software is already loaded. The BASIC software interacts with the DOS software (in other words, BASIC uses the DOS data handling and file management systems).

BASIC stands for Beginner's All-purpose Symbolic Instruction Code. It was created especially for use with small computers and is more straightforward than most other programming languages; that is, each command is used to carry out one function, usually to begin and end one short process. The commands are written a line at a time, each line generally containing one command. The language reflects the actual programming process: one line, one command, in a continuous sequence.

BASIC is by far the most popular programming language in the world of small computers. Many of the programs written for use with microcomputers are written in BASIC, including many of the games. You can learn to write BASIC programs too.

Loading BASIC

To get BASIC started, DOS must be in operation. If DOS is not already loaded, do it now. If DOS is loaded, the A> prompt will be on the left side of the screen. Chapter 4 explains how to get DOS up and running.

Next to the A> prompt, type:

```
BASIC
```

and press **Enter** or **Return**.

The BASIC screen display should now appear. It should look something like this:

Loading BASIC

When BASIC is in operation, you will see the "Ok" prompt. This is like the A> prompt for DOS. It means that BASIC is ready for you to enter a BASIC command.

When you are ready to get out of BASIC and return to DOS, just type

```
SYSTEM
```

and press **Enter** or **Return**. This will immediately take you out of BASIC and back into DOS. You can use the DOS file management system to manage the BASIC programs you create.

BASIC Command Summary

BASIC consists of many different commands. Some of them are very simple; BASIC commands are often regular English words.

Commands in BASIC are usually used to start and then stop one action. For example, the BASIC command PRINT tells the computer to print the data following on the screen. There are other commands in BASIC that are very complicated. You can't always tell what is being done by the BASIC system unless you know how these commands work. Commands that deal with screen graphics and commands that create sounds are examples of these. For the more complicated commands, you should refer to *Programming in BASIC*.

Common Commands

Some common BASIC commands are listed as follows:

CLS	(Clear screen) Erases everything from the screen display.
COLOR	Changes the foreground and background colors of the screen (if you have a color display monitor).
DATA	Used to enter data to be read by the program's READ statement.
DEL	(Delete) Deletes lines from a program.
DRAW	Draws figures on the screen.
EDIT	Used to edit lines in an existing program.
END	Terminates a program's execution, closes all the open files, and returns to the BASIC system.
FILES	Displays a list of all the stored files.

Common Commands

FOR ... NEXT	Two commands used together to command the beginning and end of a series of instructions that are to be performed repeatedly for a specified number of times.
GOSUB ... RETURN	Two commands used together to tell the system to go to a *subroutine* and then return.
GOTO	Transfers control to a specified line number in the program.
IF ... THEN	Two commands usually used together to transfer control to a specified program line number if specified conditions are met.
INPUT	Stops the program to accept input from the keyboard.
LET	Assigns a value to a variable.
LLIST	Like LIST, but the listing is printed by the printer.
LOCATE	Moves the cursor to the specified position on the screen.
NAME	Changes the name of a file.
NEW	Clears the currently active program from memory.
PLAY	Plays a melody using the computer's sound speaker.
PRINT	Displays a message on the screen.
LPRINT	Like PRINT, except that the message is printed by the printer.
READ	Reads values from a DATA statement.
REM	(Remark) Precedes a remark (a reminder to the program writer) that will be ignored by the system.

RENUM	(Renumber) Used to renumber the lines of the program.
SOUND	Used to generate a tone through the computer's speaker.
SYSTEM	Used to leave BASIC and go back to DOS.

In addition to the commands summarized above, there are many other commands in BASIC. Some of them are very specialized; others are fairly straightforward.

Many of the BASIC commands sound interesting (for example, COLOR, DRAW, or PLAY). Although their purpose might seem obvious, they can be very complicated. For more information, refer to *Programming in BASIC*.

NOTE:

The following common commands are very important in BASIC:

RUN	Tells the system to go through the sequence of lines and perform the commanded operations.
LIST	Tells the system to list on the screen all of the lines entered so far.
LOAD	Tells the system to bring into active memory the program named (it must already be stored) so it can be run.
SAVE	Tells the system to save the program named by writing its contents on the diskette or fixed disk.

File Handling Commands

Some BASIC commands have the same functions as DOS commands. They are used to manage your files. These commands can be used to manage files created in BASIC or in DOS. The command you use in BASIC may be different from the command you use in DOS, even though it has the same purpose. For example, the command FILES in BASIC does the same thing as the command DIR in DOS. Both ask the system to display (on the screen) a list of the files currently stored.

In DOS, you enter the DIR command next to the A> prompt. In BASIC, you enter the FILES command (in either uppercase or lowercase) in the first column on the left side of the screen, below the "Ok" prompt. (You don't have to exit BASIC to do this, even though you may be displaying DOS files.) Just type the word

```
FILES
```

and press the **Enter** or **Return** key.

The system will display the contents of the diskette that is in the default drive. If the DOS diskette is still in the top diskette drive, the display on the screen should look something like this:

```
Ok
files
A:/
COMMAND .COM    ANSI    .SYS    FORMAT  .COM    CHKDSK  .COM
SYS     .COM    DISKCOPY .COM   DISKCOMP .COM   COMP    .COM
EDLIN   .COM    MODE    .COM    FDISK   .COM    BACKUP  .COM
RESTORE .COM    PRINT   .COM    RECOVER .COM    ASSIGN  .COM
TREE    .COM    GRAPHICS .COM   SORT    .EXE    FIND    .EXE
MORE    .COM    EXE2BIN .EXE    LINK    .EXE    DEBUG   .COM
ROMVER  .COM    CLS2    .COM    CLS3    .COM    BASIC   .EXE
DEMO    .BAS    CHAR    .BAS    COLORI  .BAS    COLORII .BAS
BUTTERF .BAS    CIRLIN  .BAS    BUBBLE  .BAS    CHARACT .BAS
   6144 Bytes free
```

BASIC commands that are similar to DOS commands are listed in the following table.

BASIC Command	DOS Command	Function
FILES	DIR	Used to display the names of the files that are stored.
NAME	RENAME	Used to change the name of a file.
KILL	DEL	Used to delete a file.
DATE$	DATE	Used to ask the system to display the current date.
TIME$	TIME	Used to ask the system to display the current time.

Writing BASIC Programs

To write one of your own BASIC programs, you need to follow these procedures.

First, enter a line number.

Commands are sent to the system in sequence. Each step in the sequence is entered on a new line. The system determines the next step in the sequence by looking for the next line number.

The order in which you enter the line numbers doesn't matter; BASIC sorts them out later. The system first reads and acts upon the lowest numbered line and continues in this way, up to the highest numbered line. Then it stops and returns to the beginning BASIC screen.

Generally, you enter one BASIC command on each line. For example, the PRINT command tells the system to print (on the screen) the words or numbers that follow PRINT. So, to print a sequence of numbers on the screen, you could number your first line 10. It's a good idea to number your lines by 10's or by 100's in case you want to add new lines in between the old lines later.

You could enter the program like this, pressing the **Enter** key after each line:

```
10 PRINT 1
20 PRINT 2
30 PRINT 4
```

This little program will print the numbers listed, a number on each line.

Later, if you decide you want to print the number 3 after the number 2, add another line:

```
25 PRINT 3
```

The computer stores it in the proper sequence, like this:

```
10 PRINT 1
20 PRINT 2
25 PRINT 3
30 PRINT 4
```

When you run the program, the system acts on each line in sequence, printing 1 on the first line, 2 on the second line, and so on.

Second, enter a BASIC command.

After the line number, you must enter a BASIC command that the system recognizes. (*Programming in BASIC* lists all of the commands.) The BASIC command is typed next to the line number (with a space after the line number) like this:

```
10 PRINT "aaaBBBccc123"
```

Third, enter any data you want that command to act on.

In the previous example, line number 10 is followed by a space, then by the PRINT command and another space. The system recognizes the line as a command to print whatever follows; in this case, the words inside the quotation marks.

When you run the program, the system acts on the command

```
10 PRINT "aaaBBBccc123"
```

after it acts on any line numbered lower than 10, and before any line numbered higher than 10.

Notice that the phrase to be printed is enclosed in quotation marks. Any time you ask the system to print letters (or a combination of letters and numbers), you must enclose them in quotation marks. The quotation marks are not printed; only the characters inside the quotation marks are printed.

The preceding example can stand alone as a complete program. There is no minimum number of lines in a BASIC program. There is no maximum either; the only limit is the amount of memory storage space you have in your personal computer. The SPERRY Personal Computer has enough room for programs consisting of many thousands of lines.

After you enter a line with one command, you can tell the system to run that program. In the preceding example, it would print the message

```
aaaBBBccc123
```

and then stop.

Writing Your Own Programs

Try writing a simple program. Remember the essential steps:

1. Enter a line number (and leave a space).

2. Type a BASIC command (and leave another space).

3. Enter any data you want that command to act on.

The PRINT command is an easy command that will be used in almost every program you write. Here's how you program the system to print a message on the screen, using three PRINT commands in a 3-line program:

```
10 PRINT "Program number 1"
20 PRINT
30 PRINT "This is my first program."
```

Type this mini-program on your screen. (Remember to press the **Enter** or **Return** key after typing each line.)

If you tell the system to run the program (type RUN and press the **Enter** or **Return** key), the following message should appear on the screen:

```
Program number 1

This is my first program.
```

In line 20 of the example, the PRINT command is not followed by any data. This results in a blank line. The system does *exactly* what you tell it to do; if you want certain spaces between words or between lines, you have to tell the system to do it.

Once your program is running, all you have to do is type the word RUN and press the **Enter** or **Return** key. The message will again be printed on the screen. Your program is automatically stored in the computer's memory and stays there until you begin a new program by typing the word NEW.

NOTE: About Bugs

When a program has problems, programmers say it has *bugs*. It usually means that some simple problem was overlooked while you were writing the program. If your 3-line print program has a bug in it and won't print the message on the screen, look at what you entered. Make sure you entered a line number and left the proper number of spaces. Be sure you spelled PRINT correctly and that you used quotation marks before and after the message to be printed on the screen. Don't forget to press the **Enter** or **Return** key after typing each line.

To find out what is in active memory, type the word

```
LIST
```

and press the **Enter** or **Return** key.

The system will list all the program lines currently stored in its memory. You will be able to see your complete program, in the correct sequence, by line number.

Saving Your Programs

Up to now, your program is stored only in *temporary* memory inside the PC. If you want to permanently store your programs, you must tell the PC to do so.

If the Ok prompt is on the left of the screen, type the word SAVE, a space, and quotation marks. Then type the name you want to give the program. (It will be stored on the disk by that name followed by a period and the extension BAS, for BASIC.)

Try saving the 3-line PRINT program you just wrote. Let's say you want to name the program MY1. Type the word SAVE, followed by a space, then quotation marks. Then, with no space, type MY1.

Here is how it should appear on the screen:

```
SAVE "MY1
```

When you press the **Enter** or **Return** key, the program in active memory is saved in the default drive, with the name MY1.BAS. (All programs created in BASIC will have the .BAS extension added to the name.)

Notice that the SAVE command requires quotation marks only in front of the program name; you don't need them after the name. You do that only in your PRINT statements.

To be sure the program was saved, type

```
FILES
```

and press the **Return** or **Enter** key. You will get a complete listing of all the files in the default drive.

You may also return to DOS by typing "SYSTEM" and pressing **Enter** or **Return**. Enter the DIR command.

The program you saved should look like this:

```
MY1        BAS        xx        6-21-83        10.23a
```

In place of the *xx* there will be a number indicating how much memory space the program took. The date and time the program was stored is useful information; you can use it to keep track of several versions of the same program by noting the date and time each was stored.

Running Your BASIC Program

Once you have written a BASIC program and stored it, you can run it any time you want to. Make sure that the diskette with the program on it is in the default drive. Then load that program into the computer's memory.

If you are in BASIC, type the word LOAD, leave a space, type quotation marks, and then enter the name of the program you want to load. It should look like this:

```
LOAD "my1
```

Running Programs

The system will find the program MY1 on the diskette and load it into memory. Then, enter the word RUN and the program will run again.

You don't have to use the SAVE command to store it again. Even if you use the NEW command to clear the computer's memory, the original copy you stored under the name MY1 is still stored there. You can load a program as often as you want.

NOTE: About Function Keys

Whenever BASIC is loaded, a row of words is displayed along the bottom of the screen. These words are reminders that the *function* keys at the left side of the keyboard are programmed and active. Each function key is programmed to perform a complicated function when you press that key.

In BASIC, these keys have already been programmed. For example, to RUN a program you usually have to type the word RUN and press the **Enter** key. But function key **F2** is programmed to enter that command for you. To run the program currently active in memory, just press **F2**.

A description of the preprogrammed function keys is provided in Table 5-1.

Table 5-1. Function Key Functions

Function Key	Function	Description
F1	LIST	Displays the existing lines, in numbered sequence, of the program currently in memory.
F2	RUN	Tells the system to carry out the sequence of statements of the program currently in memory.
F3	LOAD <filename>	Reads the named file from diskette into memory.
F4	SAVE <filename>	Reads the program currently in memory and writes it to the diskette, using the specified filename.
F5	CONT	Restarts a program after it has been interrupted by the **Ctrl Break** key sequence.
F6	LPT1	Activates the attached printer. (Same as the **Prt Sc** key.)
F7	TRON	Turns trace on. Displays the line number of a program as it is run.
F8	TROFF	Truns trace off.
F9	KEY	Changes the function of the other function keys.
F10	SCREEN	Changes the program from graphics mode to text mode.

Learning to Program

Now that you know how to write and save BASIC programs, try to write some of your own. When you write programs, it is a good idea to map out a plan of what you want the system to do on paper.

Many books that teach the principles of programming in BASIC contain sample programs that you can copy and then store. Copying programs is a good way to learn to program. Carefully copy the program, make sure it runs, then store it using the SAVE command. You can often tailor an existing program to your needs.

You can test your practice programs by running the program at each stage of development. As you add each feature, try running it before you add more. Remember, if your modifications don't work, you can always cancel them by typing NEW and then loading the original again. (It will still be stored in the original form.)

Running Other Programs

Your SPERRY BASIC software can load and run the programs you write, as well as many other programs that were originally written in a form of BASIC compatible with SPERRY BASIC. Any program that includes the .BAS extension as part of its name should run on your SPERRY PC, although you might have to modify it to account for minor differences in command structure.

To see if a program will run, insert the diskette containing the program into the default diskette drive. Use the LOAD command to load the program into active memory. Then enter the RUN command. Unless there are some unusual commands in the original program, the program should begin to present the sequence of programmed screen displays.

You can use the LIST command to check the lines of the coding in the program. If the program won't run properly, look for commands at the beginning of each line that don't match the set of commands listed in *Programming in BASIC*. Sometimes you can fix a program yourself by changing a few troublesome format problems, and learn a lot about programming at the same time. Be sure to make a backup copy of the program before you try to modify it.

Some application programs require BASIC to run. If you attempt to run such a program without BASIC in the default drive, you will see the message:

```
Bad command or filename
```

This means that the operating system cannot find BASIC. To run the program, copy your BASIC files (BASIC.COM, BASICA.COM, and BASICA.EXE) onto your application program diskette.

Running Other Programs

If there isn't enough room on the diskette, just copy BASIC.COM and BASICA.COM.

Then, when you try to run your program, you will see the prompt:

```
* insert diskette containing BASICA.EXE and type
  in drive designation (A, B, ...)
```

Insert your BASIC program diskette and type that drive letter. BASIC will be read into memory. You can now run your program.

If you removed the application diskette, the system will prompt:

```
* Replace diskette if necessary
  strike any key when ready
```

You can now reinsert your application diskette and run your program.

Sample Programs

Some sample programs are included on your BASIC diskette. Just use the DIR command to list the files on the diskette that have the .BAS extension. You can load and run these programs in the usual way to test the capabilities of your SPERRY Personal Computer.

Some of the sample programs demonstrate the color graphics capabilities of the PC color display monitor. Unless you are using a color display monitor, these programs will not run.

Chapter 6. Problem Solving

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Chapter 6. Problem Solving

This chapter is designed to help you solve problems you might run into while you are using your personal computer.

It is divided into four main sections:

1. System Startup

   This section analyzes possible problems with the system unit, the display monitor, the diskette drives, the fixed disk, and the keyboard.

2. Diagnostic Diskette

   This section discribes how to use the diagnostic diskette to pinpoint system problems.

3. Switch Settings

   This section describes the procedure for resetting switches when you change your system configuration or operating mode.

4. Error Messages

   This section lists some of the common error messages.

System Startup

Before you turn your personal computer on, be sure everything is in order. Make sure the system unit is unplugged from the wall outlet while you are securing the cables.

Initial Power-On Checklist

- Make sure the power switch on the lower right front of the system unit is turned off (Figure 1).
- Make sure all of the cables and power cords are plugged securely into the correct sockets (Figure 2).

  The monochrome display monitor must be plugged into the system unit. If you are using a color display monitor, it can be connected to a separate electrical outlet.
- Plug the power cord from the system unit into an electrical outlet (Figure 2).

  Your SPERRY Personal Computer is equipped with a UL-approved, CSA-certified, 3-pronged plug. To avoid electrical shock, make sure that it is only plugged into a properly grounded 3-hole receptacle.
- Insert the DOS diskette into the default drive. (Loading the DOS software is described in Chapter 4.)
- Turn the power switch on.

If the system is working properly, all you have to do each time you want to use the system is insert the operating system diskette and press the power switch on the system unit (Figure 1).

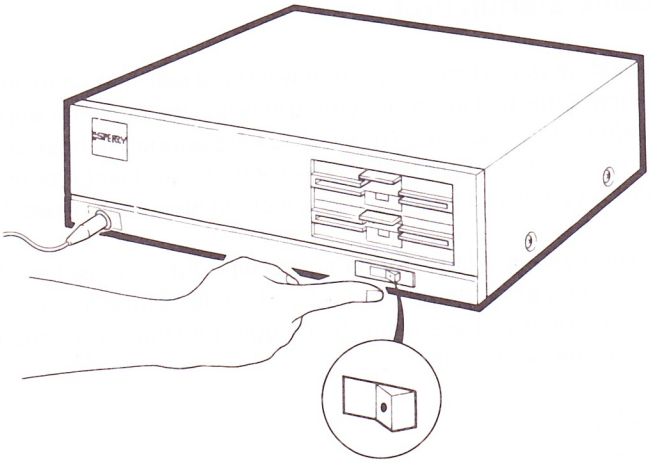


Figure 1

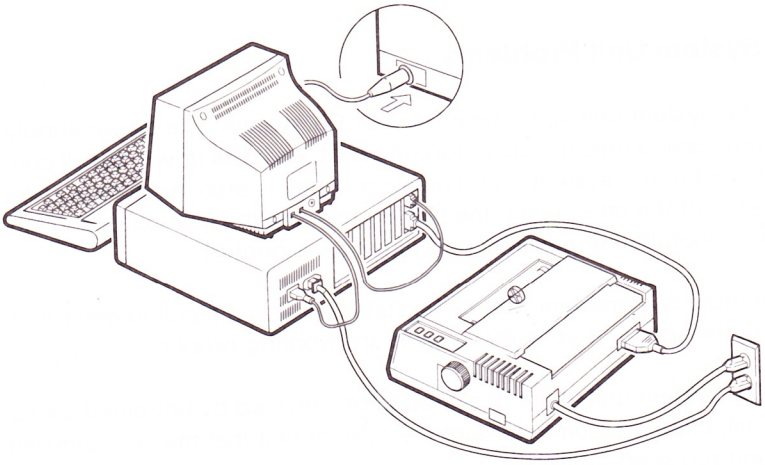


Figure 2

Possible Startup Problems

If the system is working properly, it will run a self-test on its internal operation. If this test finds everything in order, the machine will emit a beep after a few seconds. The beep is loud enough to hear 30 to 50 feet away in a fairly quiet office environment, and lasts for about ¼ second. If you do not hear the beep, it could mean one of two things:

- The system unit is not getting power. Turn the switch off and recheck all of the power cord and cable connections. Test the wall outlet you are using by plugging a lamp or an appliance into the same outlet.

  OR

- There is a problem with the internal operation of your PC. You may need to have the system unit serviced. But before you call for help, there are some things you can try.

System Unit Problems

The system unit is the heart of your PC system. The power supply, processing unit, memory storage areas, and disk drives are all contained in the system unit. The system unit is also the controller for each of the other units: the display monitor, the keyboard, and any peripherals that are attached (such as a printer).

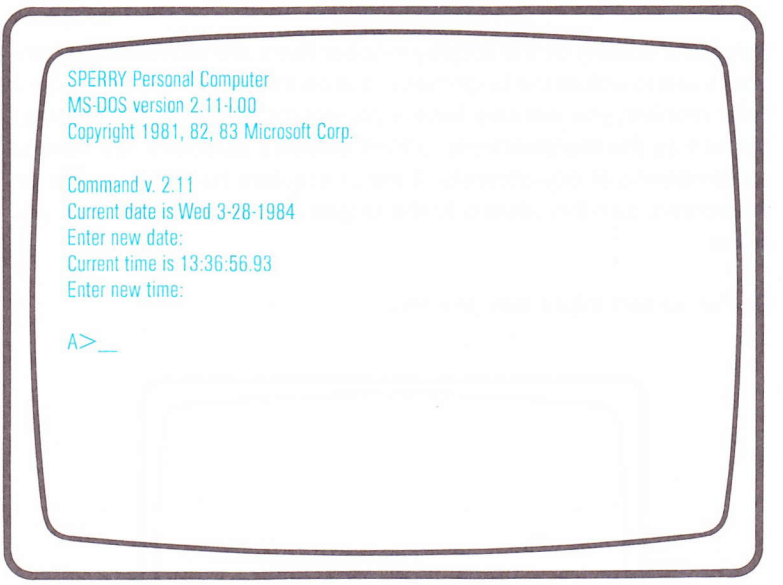
If there is a problem with the system unit, it is difficult to determine if other parts of your PC system are working properly.

The system unit is not designed to be serviced by untrained users. Still, there are some parts of the system unit that may be removed and replaced entirely.

Chapter 7 contains detailed descriptions of each of the replaceable modules within the system unit. Installed modules should usually be removed only upon the advice of a qualified service representative, and then, the service instructions must be followed very carefully.

Display Monitor Problems

When you turn the system on (with the DOS software loaded), the first thing that appears on the screen should look something like this:



This display indicates that the software is loaded and the system unit is responding.

Even if the screen display is slightly different (e.g., different words or different placement of the words), the system is probably working all right.

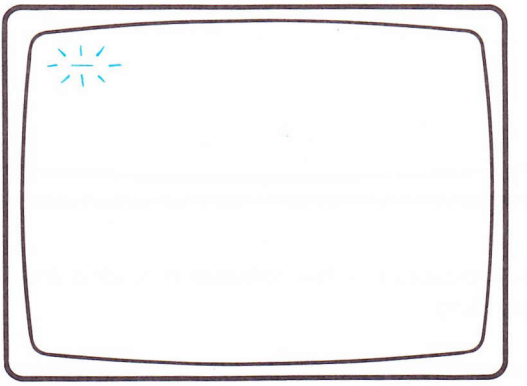
Display Problems

If nothing appears on the screen, check to see that the system unit is getting power (refer to the section on "Possible Startup Problems"). The red light next to the power switch should come on when you press the switch.

Did you hear a beep? If you hear a beep but nothing appears on the screen, try the following:

Below the screen on the display monitor there are thumbwheel controls used to adjust the brightness and contrast of the display. (On a color monitor, you will also have a control for centering the display.) Try turning the thumbwheels to their extreme positions. Try several combinations of adjustments. If the characters begin to appear on the screen, turn the wheels to the brightness and contrast that you prefer.

Or, the screen might look like this:



The blinking underscore in the upper left corner of the screen is the cursor. The system produces the cursor, but the message that should appear on the screen is produced by the software. Check the following:

- Ensure that the disk operating software is inserted in the default drive.
- Make sure you are using the correct control diskette. If you have another control diskette, try restarting the system using that diskette.
- Turn the machine off and turn it on again. Does the red light on the left side of the diskette drive door come on? It should come on for several seconds while it reads the operating commands. Then the screen should display something like the message shown in the previous section.

Or, you may get an error message. If a message appears on the screen that indicates some sort of error has occurred, turn to the section in this chapter called "Error Messages." This section should tell you what the error message means. If you can't find a message like the one that appears on your screen, check to see if you are using the MS-DOS software. (Different operating systems will display different error messages.)

Diskette Problems

Diskettes used with the SPERRY Personal Computer should be 5¼-inch flexible diskettes, either single- or double-density.

Refer to the section about diskettes and diskette drives in Chapter 3. It describes how to care for your diskettes and drives and explains how to protect your important software. Chapter 4 explains how to make backup copies of your control diskettes.

When the system reads a diskette, the red light in the left side of the drive door comes on and stays on while the information is read from the diskette into the system's memory. If the red light does not come on when you turn the power switch on, it means the system is not attempting to read the diskette. Even if the diskette is not in the default drive or the drive door is open, the system should attempt to read the diskette when you first turn the power on.

When you turn the power on, the system should respond with the beep and the screen display described previously. If something different happens, check the following:

- Did the system attempt to read the diskette? (In other words, did the red light in the diskette drive door come on soon after you turned the machine on?) If not, your problem is not with the diskette. The system should attempt to read a diskette in the default drive as soon as it is turned on.

- If the system attempted to read a diskette but the screen display did not appear, try to reinsert the diskette. Press the release lever, take out the diskette, and insert it again. The diskette should be gently inserted, label side up. Push it all the way in (there should be no resistance) until you hear a click. Then gently push the lever in the drive door straight down to lock the diskette in place. If you feel any resistance when you try to push the lever down, it may mean the diskette is not completely in. Take it out and try reinserting it. If there is resistance, check to see if there is something in the diskette drive. Sometimes a label can come loose from a diskette and inhibit insertion.

- If the system tried to read the diskette but for some reason could not, an error message might appear on the screen. Look in the last section in this chapter, "Error Messages," for the meaning of any error message that appears.

  If no error message is displayed on the screen, but the system fails to read the control diskette, try turning the machine off and then on again with a different diskette in the default drive.

- If the system tries to read a valid operating diskette that has been properly inserted, but fails, it could mean that your system unit or the diskette drive needs servicing.

Fixed Disk Problems

The fixed disk used with the SPERRY Personal Computer is a 5¼-inch, winchester-type disk.

The fixed disk can be used as a system disk or a file disk. If you want to use the fixed disk as a system disk, first copy the DOS system files to the fixed disk. Refer to the section about "Using the Fixed Disk" in Chapter 4.

When you turn the power on, you will hear a beep to indicate a successful self-test. The system will first try to read a system diskette in drive A. The light on drive A will come on while the system searches for the operating system. If you have left the drive door open, the system will then read the fixed disk. The light on the fixed disk will light briefly, and the startup screen display appears.

- Did the system attempt to read the fixed disk? If not, make sure the DOS diskette is *not* inserted in the diskette drive or that the drive door is open.

- If the light on the fixed disk drive comes on, but the message "No partition" appears, you need to create a DOS partition before you can use your fixed disk. Refer to the instructions in Chapter 4.

- If the light on the fixed disk drive comes on, but the message "Missing operating system" appears, the fixed disk is not the system disk. Load the DOS system from the DOS diskette and copy the DOS system files to the fixed disk, using the instructions in Chapter 4.

- If you are still unable to load the DOS system from the fixed disk, your system unit or the fixed disk drive could need servicing. The fixed disk is not designed to be serviced by untrained users. Report the problem to your Sperry representative.

Keyboard Problems

A problem with the keyboard can affect the way the system unit and display monitor respond. This makes it difficult to tell whether the keyboard is causing the problem.

If you suspect that the data you are entering through the keyboard is not being properly transmitted to the system unit, check the following:

Is the keyboard properly attached to the outlet on the lower left front of the system unit? Turn the system unit off. Pull the plug out and plug it back in again. Make sure the operating software diskette is in the default drive and turn the system on again. If you still have problems, it may be necessary to have the both the keyboard and the system unit serviced. (It is often impossible to tell which is causing the problem.)

Of course, certain problems are clearly caused by a faulty keyboard. Since the keyboard is a mechanical device with moving parts, purely mechanical problems can develop. For example, if a key begins to stick in either the depressed or released position, it could be something as simple as a bit of paper or dust that has fallen between the keys. Turn the machine off and unplug the power cord. Pry up the keycap very gently with the point of a knife. If the keycap does not immediately begin to come loose, give up. Some keys may be jammed and require service. If you do manage to pry the keycap up, look for something that has slipped down under the key mechanism. Sometimes you can blow it loose. Put the keycap back on and try it again. If it still sticks, the keyboard will require service.

If you press a key and the wrong character appears on the screen, it could be caused by problems in the system unit or by problems with the software. First, turn the system unit off, unplug the keyboard cable, and then try it again. If that doesn't help, try a different software diskette. If the problem continues, both the system unit and the keyboard may require servicing.

System Unit Bring-Up Test

Since the system unit is the central controller for the entire personal computer system, it is often difficult to determine whether problems are originating there. The system unit bring-up test is designed to locate problems within the system unit.

The test is conducted with all other units disconnected from the system unit. It uses the system unit's built-in speaker to specify trouble codes.

1. Turn the system unit off. Disconnect *all* cables and power cords from the system unit, except for the main power cord. Make sure the system unit power cord is plugged into a working 110/120V A.C. outlet. Open both diskette drive doors and remove all diskettes.

2. Get a pencil and a piece of paper and be ready to jot down the number and duration of any beeps you hear from the system unit. In this section, we will use a dash (—) to indicate a high-pitched beep of about a half second and a dot (.) to indicate a lower-pitched, very short beep of only a fraction of a second. If you use this notation system to record what you hear, you will be able to make comparisons using the chart that follows.

3. Turn the system unit on. The red light to the right of the switch should come on as soon as you press the switch. Within 10 seconds, you should hear the following sequence of beeps:

   — ···· One long and four short beeps to indicate that the system unit is not finding a keyboard attached.

   . One short beep to indicate the test is over.

   The little red light (LED) in the default diskette drive door should come on for about 20 seconds.

   If you hear any other sounds, refer to the table that follows.

Beeps	LED Blinks	Location of Error
no beep	X	Timer or DMA
—·	X	Memory
—··	X	IT controller
—···	X	Timer IT
—····		Keyboard
—·····		CRT controller (video RAM)
—·····		CRT controller (function)
— — ·	X	TOD

For more detailed information about possible errors or about the system unit bring-up test, refer to the SPERRY Personal Computer *Technical Reference.*

Using the Diagnostic Diskette

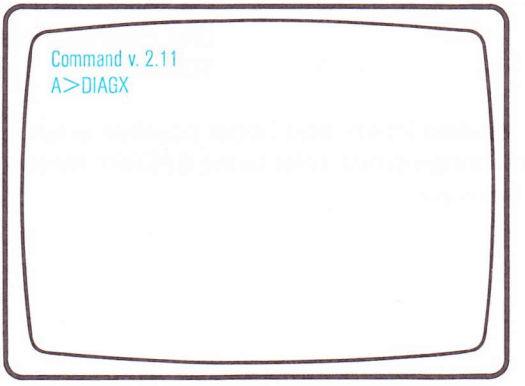
Included with your SPERRY Personal Computer System is a diagnostic diskette. This diskette contains a program (called DIAGX) that tests each part of the PC system and reports any errors it discovers.

As with any system control diskette, you should use the DISKCOPY command to make a backup copy of the diagnostic diskette. (Refer to Chapter 4 for instructions on making backup diskettes.) Use the backup copy. (Do not write-protect it.)

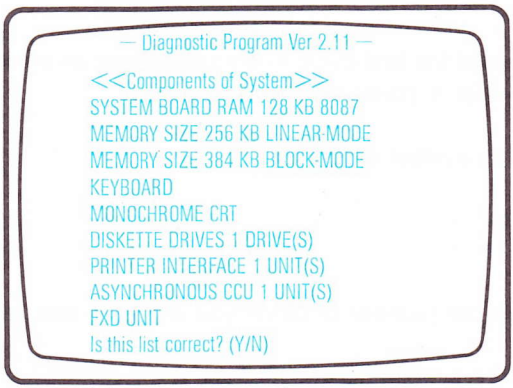
To use the diagnostic diskette:

1. Remove any diskettes from the drives. Turn the system off.

2. Insert the diagnostic diskette into the default drive and turn the system on. After a moment, the system should begin to read the diskette and the screen should change to look something like the following:



3. After a few seconds the screen should change to look something like this:



4. Check over the list carefully to make sure each of the descriptions matches the hardware components you are using, and respond to the question.

   If you respond N (No), the system displays the message:

   CHECK SWITCH SETTINGS

   This refers to the micro-switchblock settings on the system board inside the system unit. The diagnostic program checks each of these switch settings to determine the hardware configuration you should be using.

   If your configuration is different from that listed, you will have to open the system unit and change the settings. Follow the procedures listed in the section on "Switch Settings."

   If you respond to the question with Y (Yes, the list is correct) and your PC is the FXD system, the system will display:

   Do you wish to prepare the system for moving? (Y/N)

Unless you plan to move the fixed disk system, respond to this question with N and the following will be displayed.

```
Should test cycle stop when error occurs ? (Y/N)
```

If you want the test cycle to stop whenever an error is discovered, enter Y (Yes); otherwise, enter N.

Next, the system will ask:

```
Diagnostic execution multiples ? (Y/N)
How many times should test cycle ?
```

5. Specify the number of times you want the test to repeat.

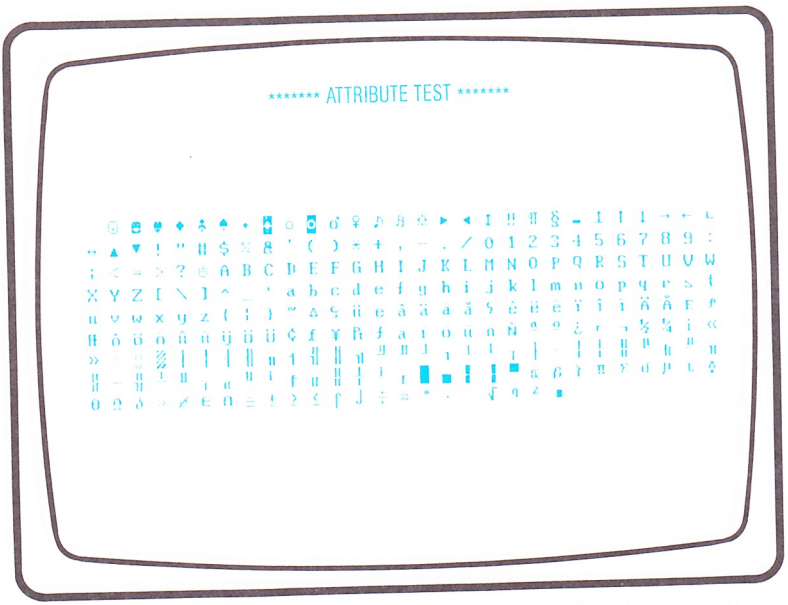
When the system begins the test, it will display:

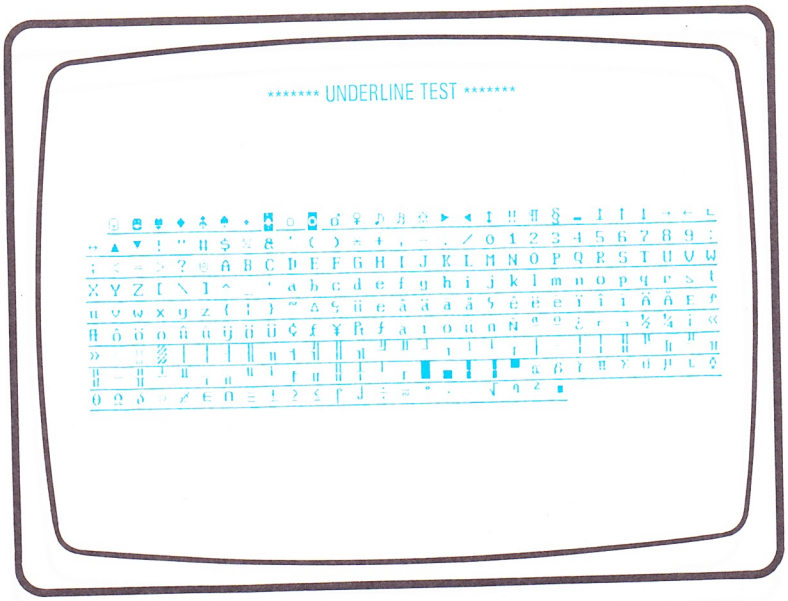
```
SYSTEM BOARD        Diagnostic test start
L-MEMORY 256 KB     Diagnostic test start
B-MEMORY 384 KB     Diagnostic test start
```

Some of these tests take a full minute or two, so you must wait. Even if the red light in the diskette drive door is not on, the system may still be completing internal checks. Wait for the next screen display.

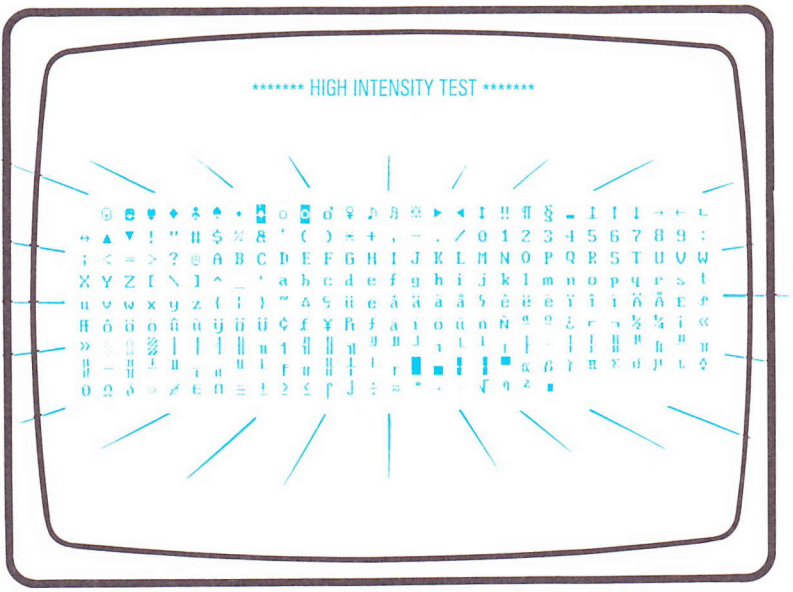
Next, the system will cycle through a series of screen displays. The following illustrations show what the test screens should look like.

Each of these screens should demonstrate the designated function. If an error is discovered, the system should report it. Refer to the section on "Error Messages" for an explanation of any error messages displayed by the system.

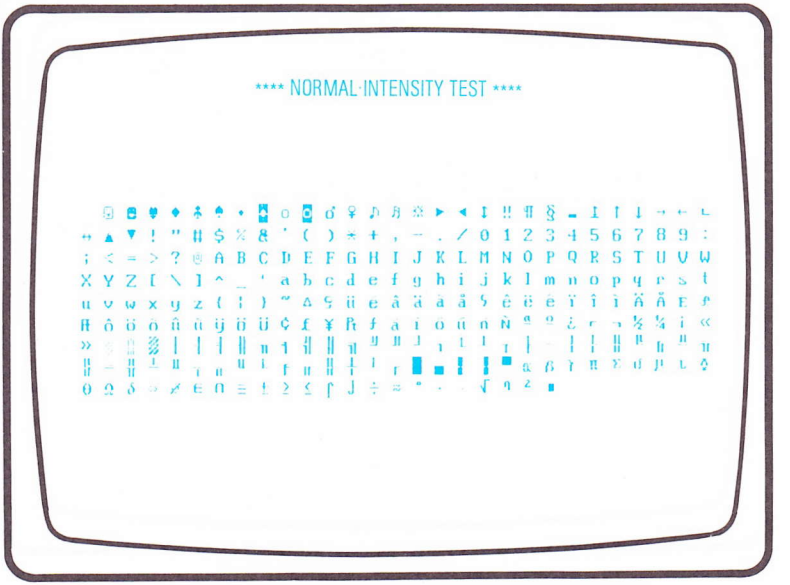

******* ATTRIBUTE TEST *******


******* UNDERLINE TEST *******

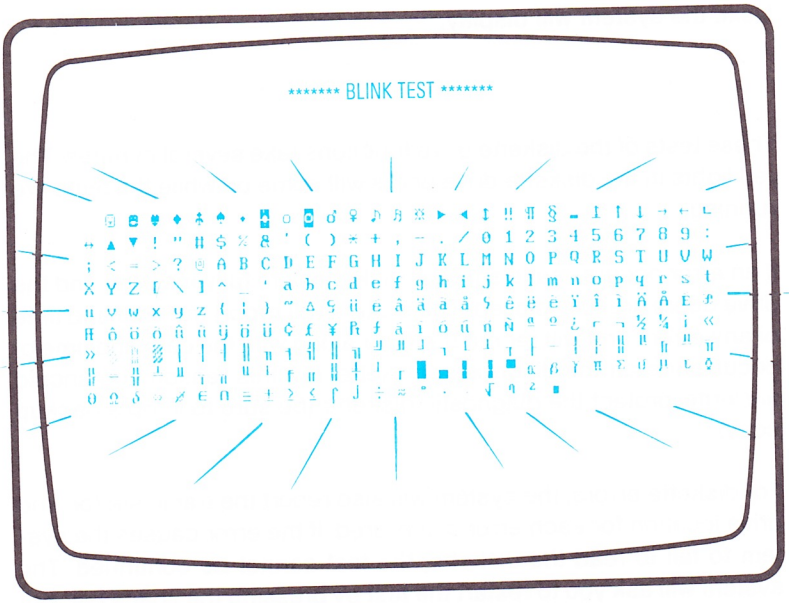
Diagnostic Diskette

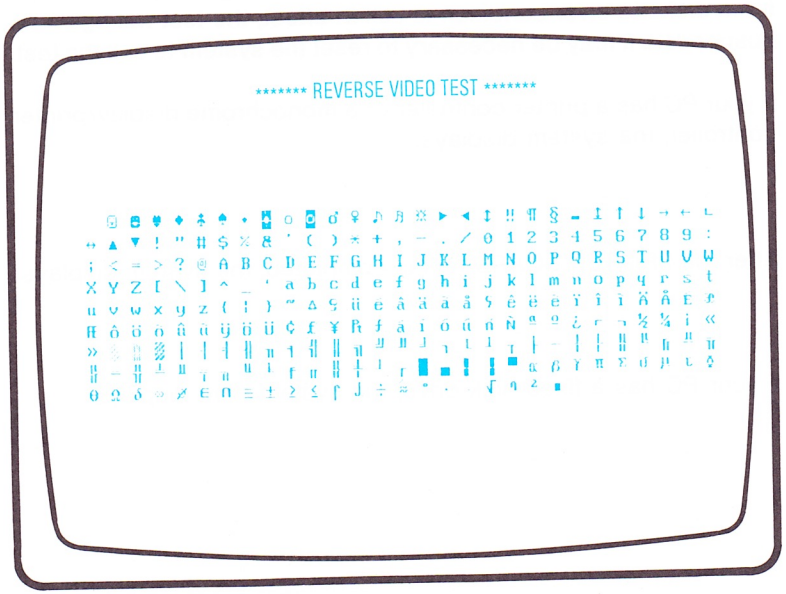


NOTE: High intensity



NOTE: Normal intensity


******* BLINK TEST *******


******* REVERSE VIDEO TEST *******

Diagnostic Diskette

Next, the system will display:

```
Diskette          Diagnostic test start
```

These tests of the diskette drive functions take several minutes. The red lights in the diskette drive doors will come on while the tests are running.

If an error occurs, make sure the diskettes are fully inserted and the drive doors are fully closed. The system will report the date and time of any errors and will record the error along with the date and time of occurrence on the diagnostic diskette. For this reason you should *not* write-protect the diagnostic diskette (be sure to keep a backup copy).

For diskette errors, the system will also report the track, sector, and drive location for each error discovered. If the error causes the system to fail to read the diskette, the test cannot be continued. The system will ask you to restart the test by pressing the space bar. But if the diskette error condition is still in effect, the test will again be suspended. It may be necessary to reset the system to exit the test.

If your PC has a printer controller or a monochrome display/printer controller, the system displays:

```
PRINTER BOARD   Diagnostic test start
```

After the PRINTER BOARD test is completed, the system displays:

```
CCU             Diagnostic test start
```

If your PC has a fixed disk drive, the system then displays:

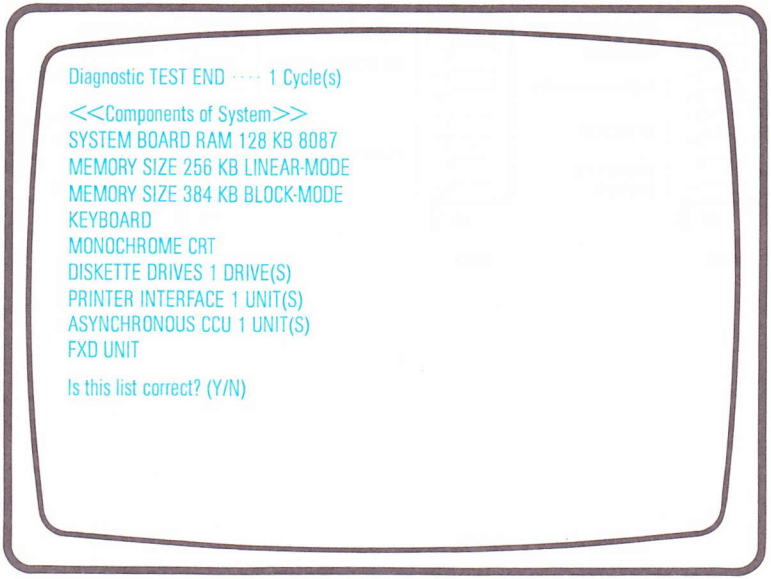
```
FXD             Diagnostic test start
```

These fixed disk drive and controller function tests take several minutes. The red light on the fixed disk drive comes on during the tests.

The system reports the date and time of any errors. This information is recorded on the diagnostic diskette along with some information about the occurrence of the error.

For fixed disk errors, the system also reports the cylinder, sector, head, and drive location, with an error code for each error discovered.

If all tests are completed successfully, the system will report the number of test cycles completed and repeat the list of system components.



Respond with Y to recycle or N to exit the test procedure.

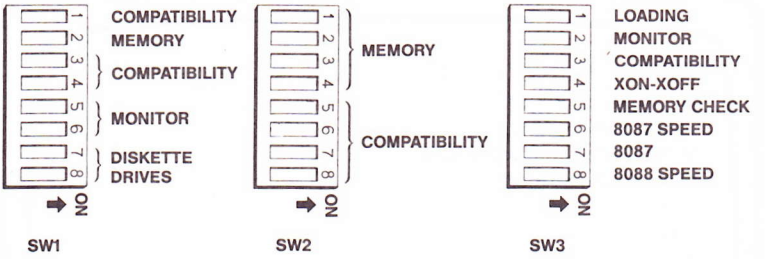
Switch Settings

Several switches may need to be reset, depending on the hardware you are using with your system. These switches are in very small switchblocks on the system board or optional controller boards inside the system unit, and on the rear of the system unit.

Use something with a fairly sharp point (like a ballpoint pen or very small screwdriver) to flip the switches.

More complete explanations of the functions of these switchblocks can be found in the SPERRY Personal Computer *Technical Reference.*

System Unit Switch Summary



For software compatibility, you may need to reset SW3 switch 3 (page 6-29). Refer to the SPERRY Personal Computer *Technical Reference* for an explanation of the compatibility switches.

If you add memory, reset SW2 switches 1 through 4. You may also need to reset SW1 switch 2 (page 6-30).

If you change the type of display monitor you use, you may need to reset SW1 switches 5 and 6 and SW3 switch 2 (page 6-33).

If you add or remove diskette drives, reset SW1 switches 7 and 8 (page 6-34).

If you add printers, reset the switches on the printer controller boards (page 6-35.)

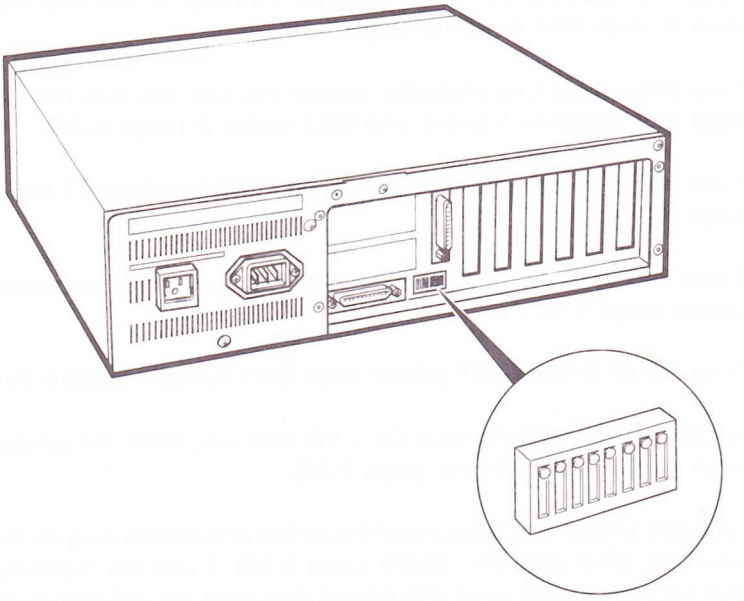
If you use an X-ON/X-OFF printer, reset SW3 switch 4 (page 6-24).

To change the asynchronous CCU I/O address, move the jumper plugs on the system board (page 6-36).

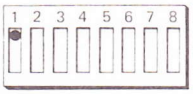
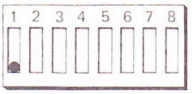
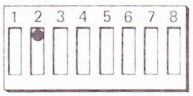
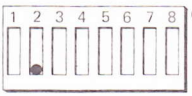
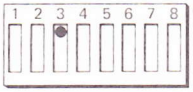
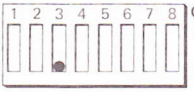
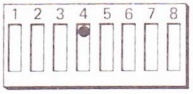
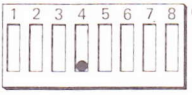
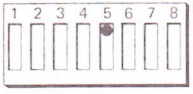
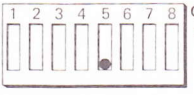
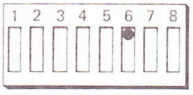
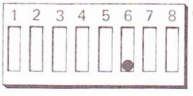
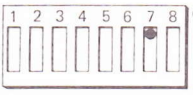
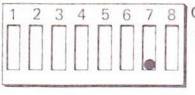
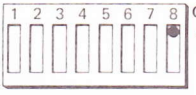
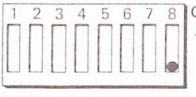
If you add a fixed disk drive, reset the switch and jumper plug on the fixed disk drive controller board (page 6-38). If you are replacing your second diskette drive with a fixed disk drive, you will also need to reset SW1 switches 7 and 8 (page 6-34).

Switch SW3

Locate the SW3 switch using the illustration below.



The SW3 switches can be set ON or OFF. The effects of the two possible settings for each switch are described in the table opposite.

SWITCH ON		SWITCH OFF	
	Normal loading		Repeated hardware self-test
	Medium resolution monitor		High resolution monitor
	Normal operation		Disables advanced features*
	RS-232C non-XON/XOFF printer		RS-232C XON/XOFF printer
	No memory check during load		Memory check during load
	Sets 8087 processor speed to 8 MHz		Sets 8087 processor speed to 4 MHz
	8087 processor not used		8087 processor used
	Sets 8088 processor speed to 8 MHz		Sets 8088 processor speed to 4 MHz

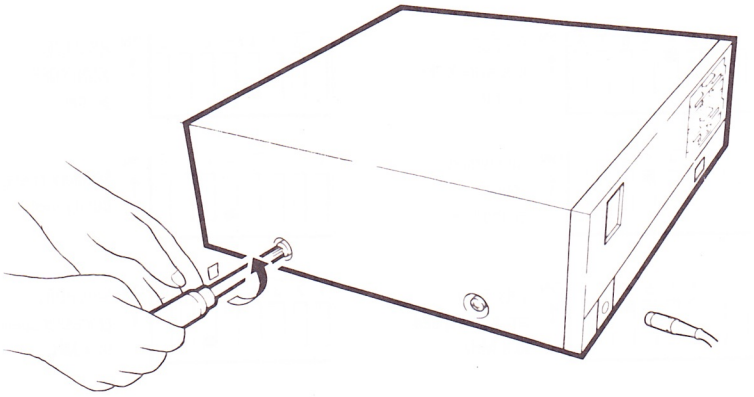
* *The SPERRY PC advanced features (high resolution and RS-232C X-ON/X-OFF printer) are incompatible with certain software packages. Setting SW3 switch 3 OFF will allow you to run these programs, but it also disables the advanced features.*

Switches SW1 and SW2

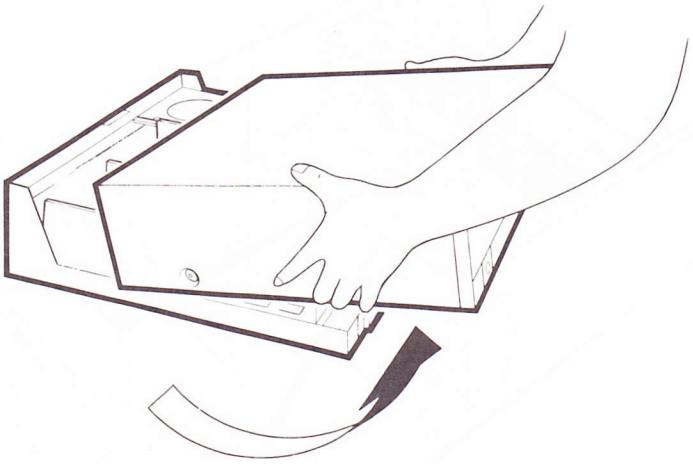
To reset switches SW1 and SW2, you have to remove the system unit's case.

1. Make sure the system unit is unplugged. Place the system unit on a table, so that you have access to both sides and rear.

   Using a Phillips-head screwdriver, remove all 5 screws (2 on each side, 1 at center rear) from the sides of the system unit's case. The illustration below shows the location of the screws.

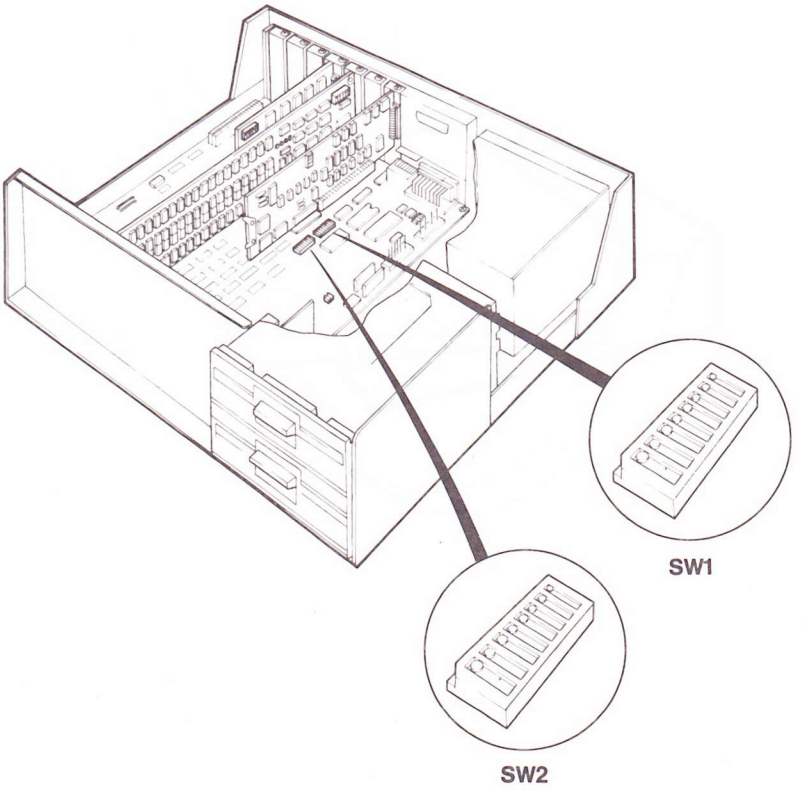


2. Carefully slide the system unit cover forward from the rear until the cover comes loose from the base – about halfway to the front. Tilt and lift the cover from the system unit and set it aside.



Switch Settings

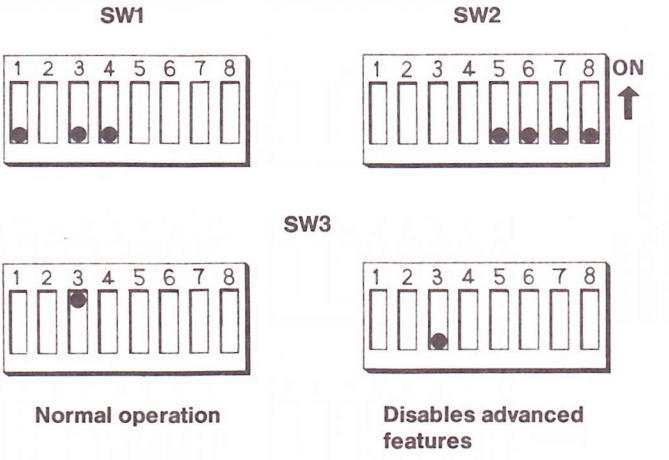
Locate the switches labeled SW1 and SW2 using the illustration below.



Compatibility

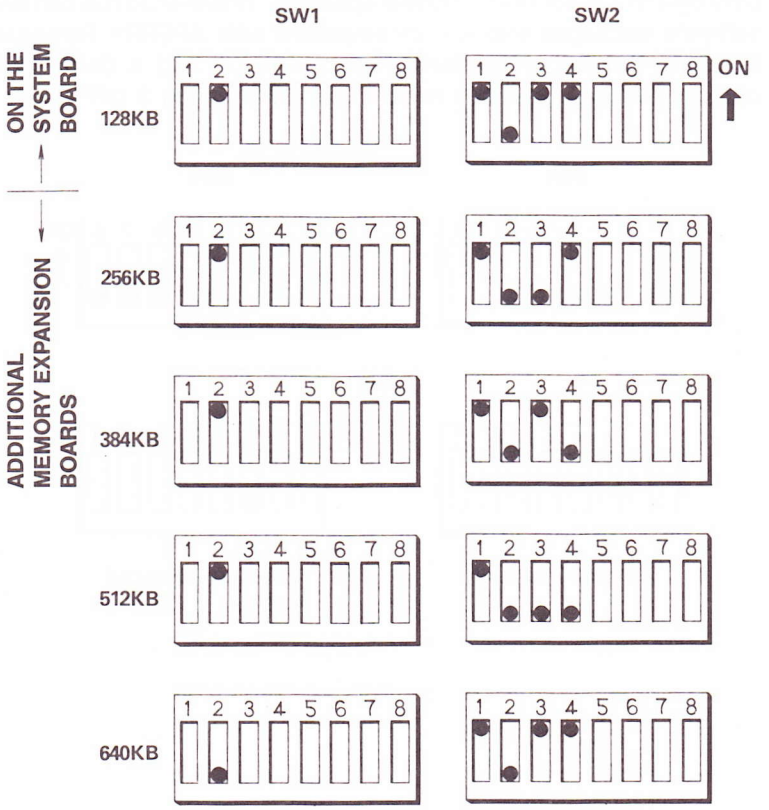
SW1 switches 1, 3, and 4, and SW2 switches 5, 6, 7, and 8 must *always* be set to the OFF position.

SW3 switch 3 is set ON for normal operation. However, to run certain software packages that are incompatible with SPERRY Personal Computer advanced features (high resolution and X-ON/X-OFF printer interface), you may need to set SW3 switch 3 OFF.

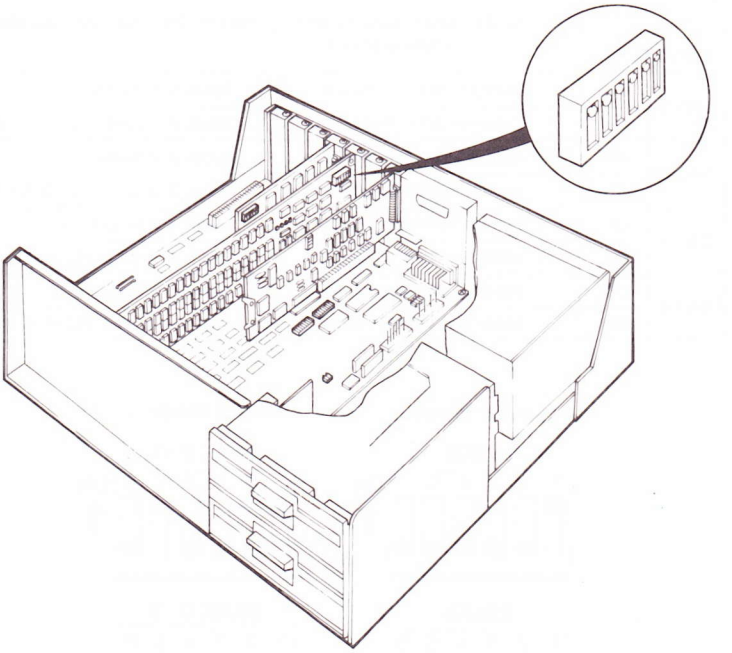


Memory Expansion

The table below indicates how switches SW1 and SW2 should be set with each memory package installed.



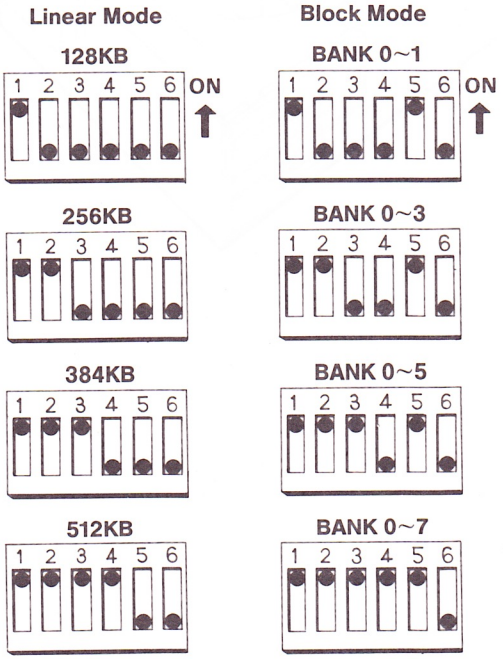
If you need to change the memory mode switches, locate them using the illustration below.



Switch Settings

Set the memory mode and size switches on the expansion memory board as indicated in the table below.

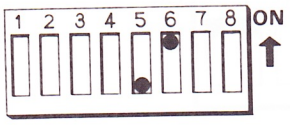
SW1-5 / SW1-1~4		SW1-5=OFF : Linear Address Mode (Normal Mode)	SW1-5=ON : Block Address Mode
SW1-1	OFF	20000H~3FFFFH Invalid	BANK 0, 1 Invalid
	ON	20000H~3FFFFH Valid	BANK 0, 1 Valid: (S2=0, S1=0)
SW1-2	OFF	40000H~5FFFFH Invalid	BANK 2, 3 Invalid
	ON	40000H~5FFFFH Valid	BANK 2, 3 Valid: (S2=0, S1=1)
SW1-3	OFF	60000H~7FFFFH Invalid	BANK 4, 5 Invalid
	ON	60000H~7FFFFH Valid	BANK 4, 5 Valid: (S2=1, S1=0)
SW1-4	OFF	80000H~9FFFFH Invalid	BANK 6, 7 Invalid
	ON	80000H~9FFFFH Valid	BANK 6, 7 Valid: (S2=1, S1=1)



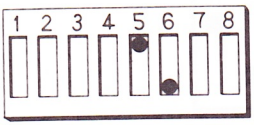
Display Monitor

Set SW1 switches 5 and 6, and SW3 switch 2 according to the table below.

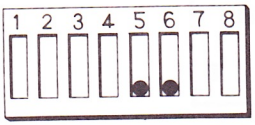
SW1



Medium resolution, high resolution, or composite color display monitor (40 columns by 25 lines)

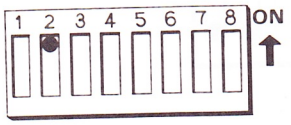


Medium resolution or high resolution color display monitor (80 columns by 25 lines)

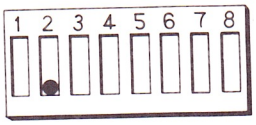


Monochrome display monitor (80 columns by 25 lines)

SW3



Medium resolution

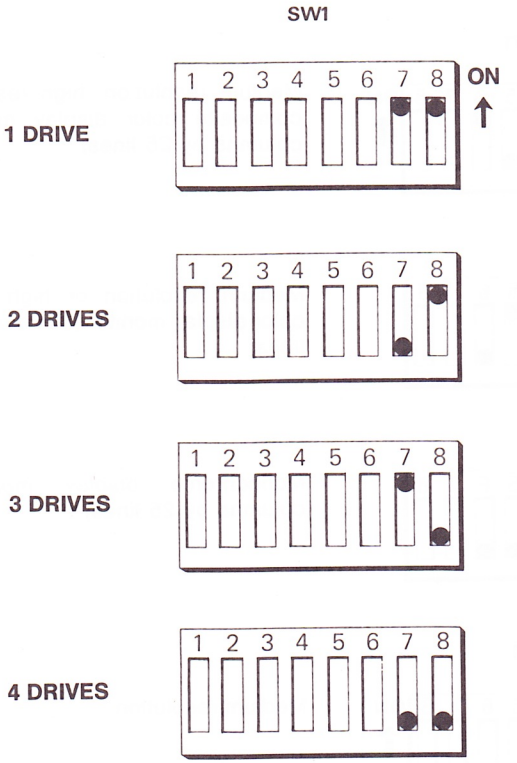


High resolution

Switch Settings

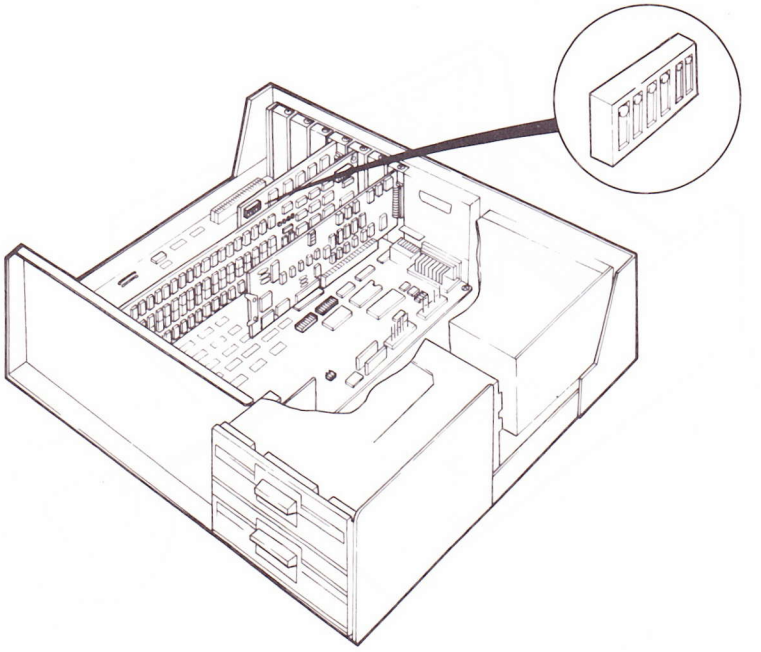
Diskette Drives

Set SW1 switches 7 and 8 as indicated in the table below.



Printers

Locate the printer controller identification switch using the illustration below.

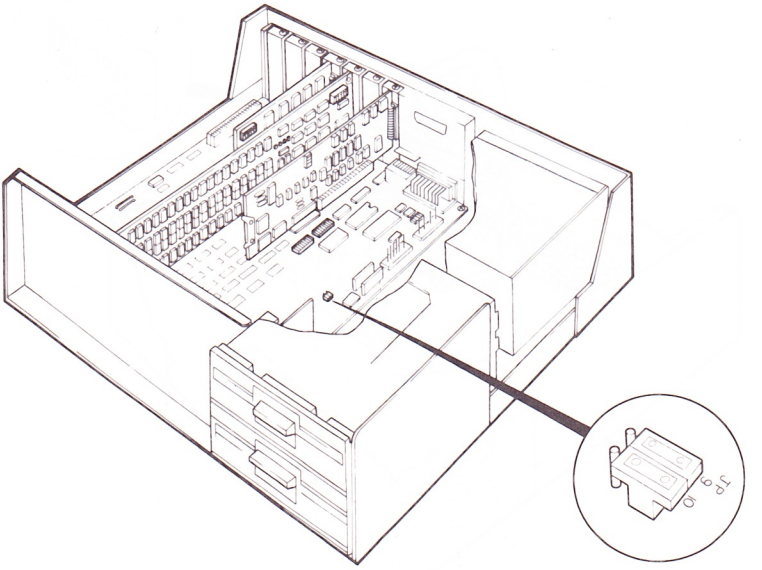


Set the printer controller identification switch as indicated in the table below. (Up to 2 printer controller boards may be installed simultaneously.)

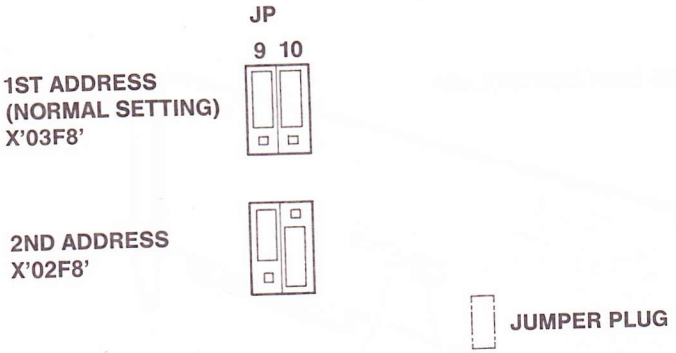
SW1-2	SW1-1	No. of Controller Boards	Port (Address)
OFF	ON	1	X'0378'
OFF	OFF	2	X'0278'

CCU

The asynchronous CCU (communication control unit) I/O (input/output) address can be changed by moving the jumper plug on the system board. Locate it using the illustration below.

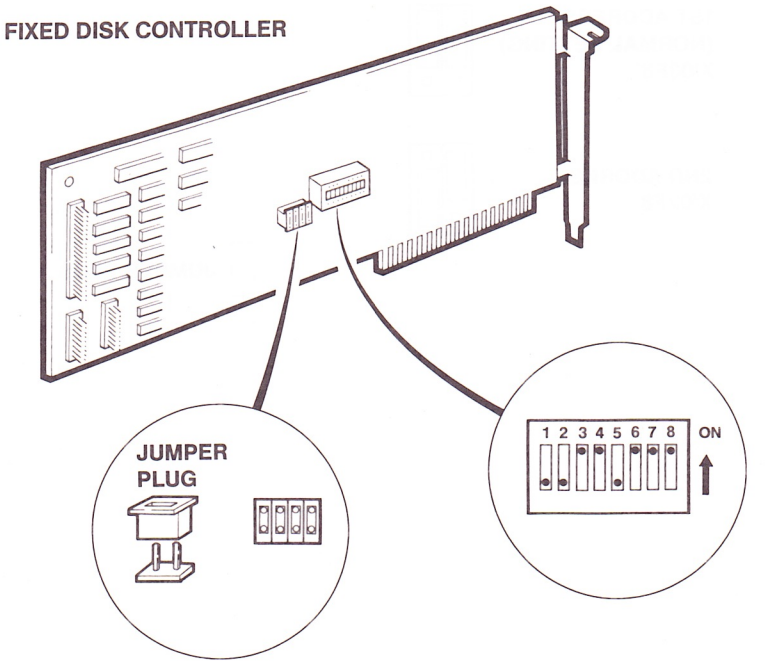


Set the jumper plugs as indicated in the table below. (Change settings when installing host computer communications boards.)



Fixed Disk

Set the fixed disk controller address switches and jumper plugs using the illustration below.



Error Messages

Diagnostic Error Codes

Code	Error
00	8088 defect
01	8259A mask register
02	8253 timer count-up signal defect
03	8237 defect
04	8255A buffer defect
05	8087 defect
06	ROM CRC error
07	Read/write RAM error
08	RAM parity check error; tip defect
09	Keyboard scan code error
10	Keyboard interrupt error
11	Diskette read/write error
12	Diskette verify error
13	TOD busy signal error
14	Monochrome CRT controller error
15	Monochrome attribute error
16	Color CRT controller error
17	Color CRT attribute error
18	CRT VRAM error
19	CCU error
20	Printer interface error
21	Not used
22	Not used
23	Fixed disk read/write error
24	Fixed disk I/O error
25	Fixed disk bad address mark read
26	Fixed disk record does not exist
27	Not used
28	Fixed disk initial parameter error
29	DMA boundary error
30	Fixed disk track defect

Diagnostic Error Codes (Continued)

Code	Error
31	Fixed disk ECC error
32	Fixed disk controller error
33	Fixed disk SEEK error
34	Fixed disk timeout error
35	Fixed disk sense operation error
36	Fixed disk controller RAM error
37	Not used

Error Messages During System Self-Test

Message	Meaning
E-FD20-SEEK ERROR	(E-Flexible Diskette 20-SEEK ERROR) Indicates errors in counting track numbers while seeking in the diskette drive.
FDC ERROR	(Flexible Diskette Controller ERROR) Indicates that no completion signal was returned to the system unit.
CRC ERROR	(Cyclic Redundancy Check ERROR) Indicates that incorrect data was found while reading data from the diskette.
BOUNDARY ERROR	Indicates that an attempt was made to transmit more than 6.4K bytes of data.
DMA ERROR	(Direct Memory Access ERROR) Indicates that data transmission between the diskette drive and memory was not completed within the specified time period. Some data may be missing.
SECTOR ERROR	Indicates that the sector demanded by the controller was not found.
PROTECT ERROR	Indicates that an attempt was made to write to a file on a write-protected diskette.
ADMARK ERROR	Indicates that the address mark was not found.
COMMAND ERROR	Indicates an unstipulated command.
E-XD20-ADDRESS BUS ERROR	Indicates an error in the address bus of the expansion box.
DATA BUS ERROR	Indicates an error in the data bus of the expansion box.
CHECKSUM ERROR	Indicates a fixed disk checksum error.

Pinpointing Trouble

If you can't figure out what is causing the problem, you may have to call in the experts. Maybe you will have to have the system serviced, or you may have access to an expert who will come and take a look. Either way, there are some things you can do to make it easier for the expert and it may help get your system back up and running sooner. (Maybe you can even get help by phone.)

First, and most important, take notes on everything that happens. Then, try everything you can think of to make the problem recur. Try to determine under what circumstances the errors appear.

Different types of software work in different ways. What might be an error condition in one operating mode could be normal in another.

Try to isolate the problem. Is the system getting power? If it is, but no characters are appearing on the screen, check the cabling between the system unit and the display monitor. Are the cables secure (both the power cord that goes to the system unit and the other cable that plugs into the system unit)? Is the monitor plugged into the correct outlet in the back of the system unit? (Some system units have more than one plug of the same type on the back.) Is the keyboard plugged securely into the left front of the system unit? Try unplugging each part of your system, one part at a time. Turn the system off, then back on again. Then try to repeat the problem operation.

When you have tried all this, you may still have the problem. But you should now also have a good set of notes about the circumstances surrounding the problem, and you may also have a better understanding of how your system works.

Chapter 7. System Options

System Unit

System Unit
RS-232C Cable
Fixed Disk Drive

Controller Boards

High Resolution Color Controller
Medium Resolution Color Controller
Monochrome Display Monitor/Printer Controller
Printer Controller
Diskette Drive Controller
128K-Byte Memory Expansion Board

Display Monitor

High Resolution Color Display Monitor
Medium Resolution Color Display Monitor
Monochrome Display Monitor
Display Monitor Pedestal
Keyboard

Peripherals

Model 5 Printer
Printer Cable

Chapter 7. System Options

Unpack your hardware components, checking the contents of each package against the Inventory Checklist (enclosed in the package) to ensure that nothing is missing.

If your printed circuit boards are not already installed in the system unit, they must be installed before you attempt to connect any cables or operate your system.

Refer to the booklets that came with your components for specific installation instructions.

If you are adding optional features to an existing system, turn off the system unit, disconnect all cables, and unplug the power cord.

The printed circuit boards you install will depend upon your particular configuration of equipment. The boards should be installed in the following sequence:

Fixed disk controller
Diskette drive controller
Color display monitor controller
Monochrome display monitor controller
Printer controller
128K-byte memory expansion board

When the controller boards have been installed, you may proceed with connecting cables and turning on your system, as described in Chapter 2.

NOTE:

Insert the booklets that come with your components in this section.

7. OPTIONS

Inventory Checklist

The following items should be included in the medium-resolution color controller package.

- Medium-resolution color display controller board
- Installation guide

If any items are missing or damaged, contact the place of purchase.

SPERRY

Personal Computer System
Medium Resolution
Color Controller
UP-10510

This document contains the latest information available at the time of preparation. Therefore, it may contain descriptions of functions not implemented at manual distribution time. To ensure that you have the latest information regarding levels of implementation and functional availability, please consult the appropriate release documentation or contact your local Sperry representative.

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Installation Guide

1. Make sure the system unit is unplugged. Place the system unit on a table, so that you have access to both sides.

   Using a Phillips-head screwdriver, remove all 5 screws (2 on each side, 1 at center rear) from the system unit (illustration 1).

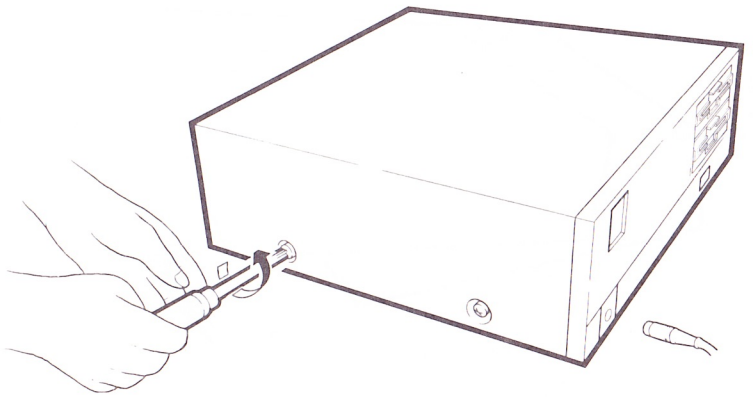

Illustration 1

Installation

2. Carefully slide the system unit cover forward from the rear until the cover comes loose from the base—about halfway to the front (illustration 2).

   Tilt and lift the cover from the system unit and set it aside.

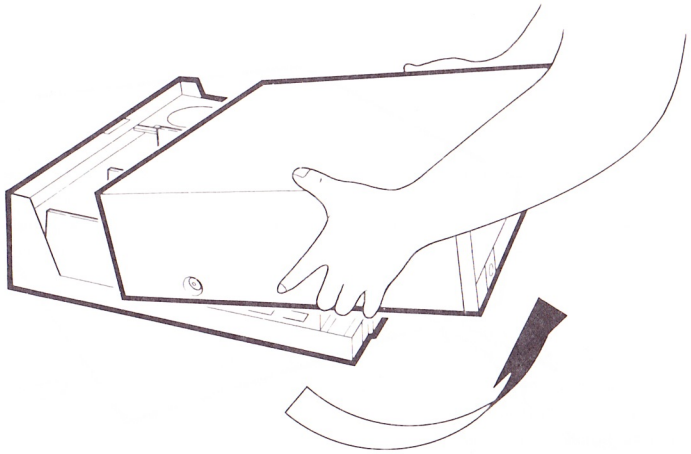

Illustration 2

To install the controller board, first remove the metal cover at the left rear inside the system unit from the *second* I/O slot.

Using a Phillips screwdriver, remove the set-screw (illustration 3).

NOTE:

The color controller board should be installed in the second I/O slot. See illustration 3.

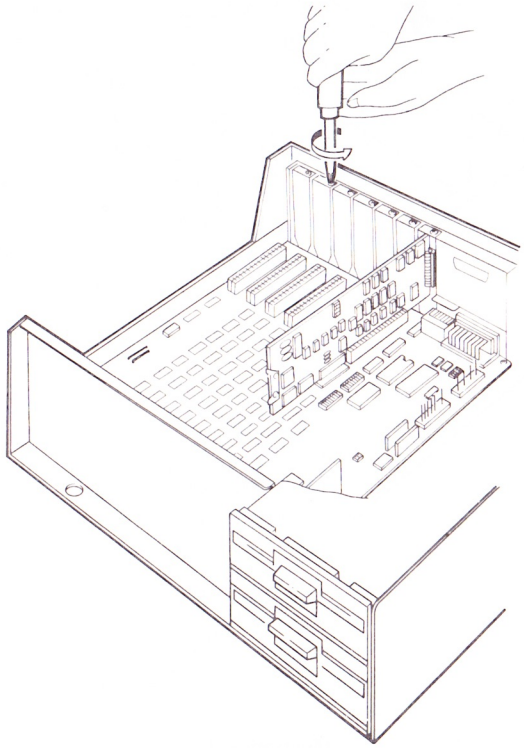

Illustration 3

7. CONTROLLERS

4. Holding *only* the edges of the plastic controller board (don't touch any of the component parts or wires), carefully push the controller board straight down so that the bottom edge locks firmly into the guide track on the floor of the system unit (illustration 4).

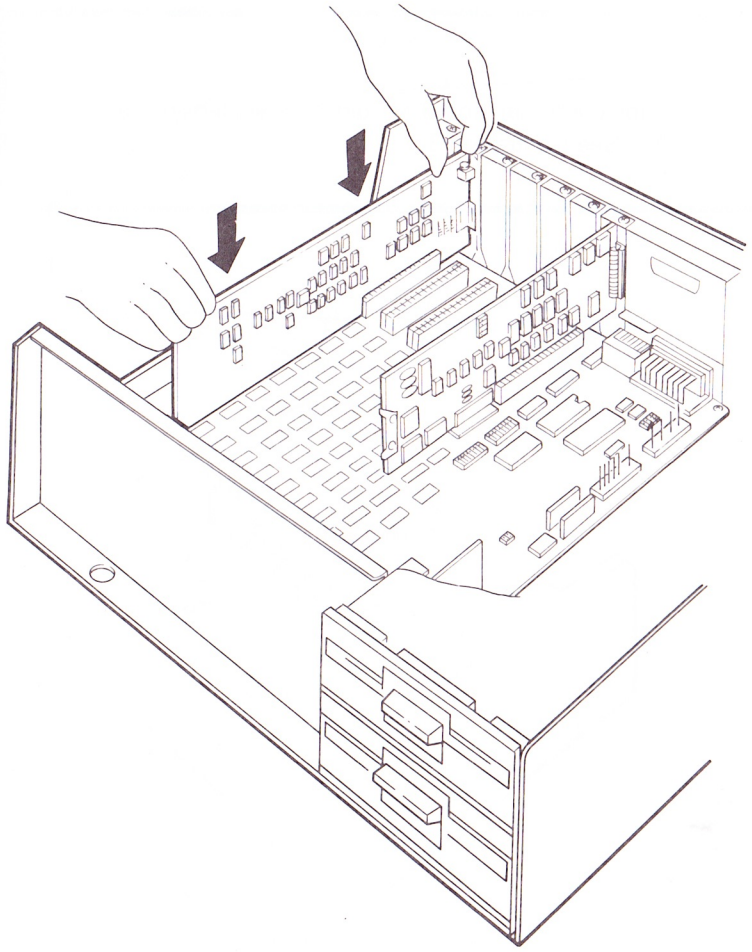

Illustration 4

5. Using the original screw, firmly tighten the new cover plate (illustration 5).

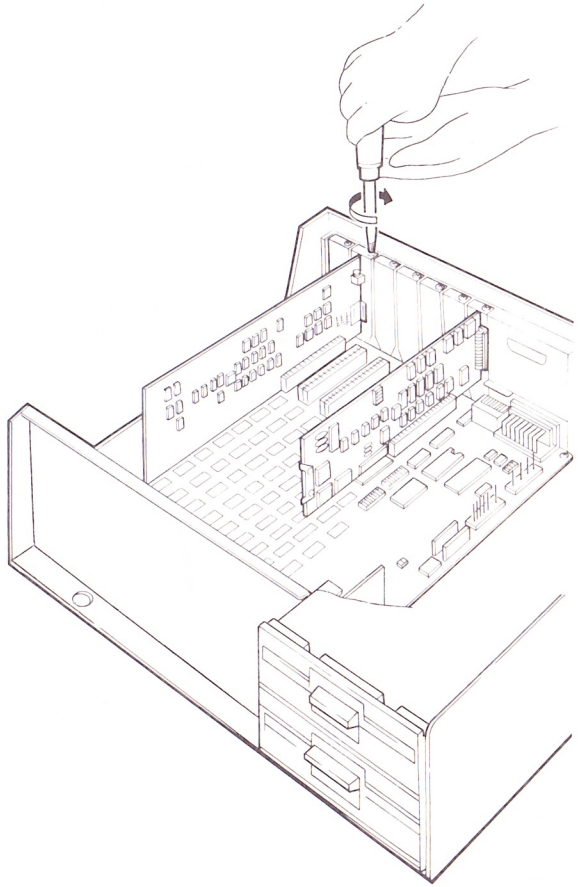

Illustration 5

If you have any other controller boards to install, you may want to install them now before replacing the system unit cover. Refer to the installation instructions included with your other controller boards.

6. Set the SW1 switch on the system board as indicated in illustrations 6 and 7.

   Use something with a fairly sharp point (like a ballpoint pen or very small screwdriver) to flip the switches.

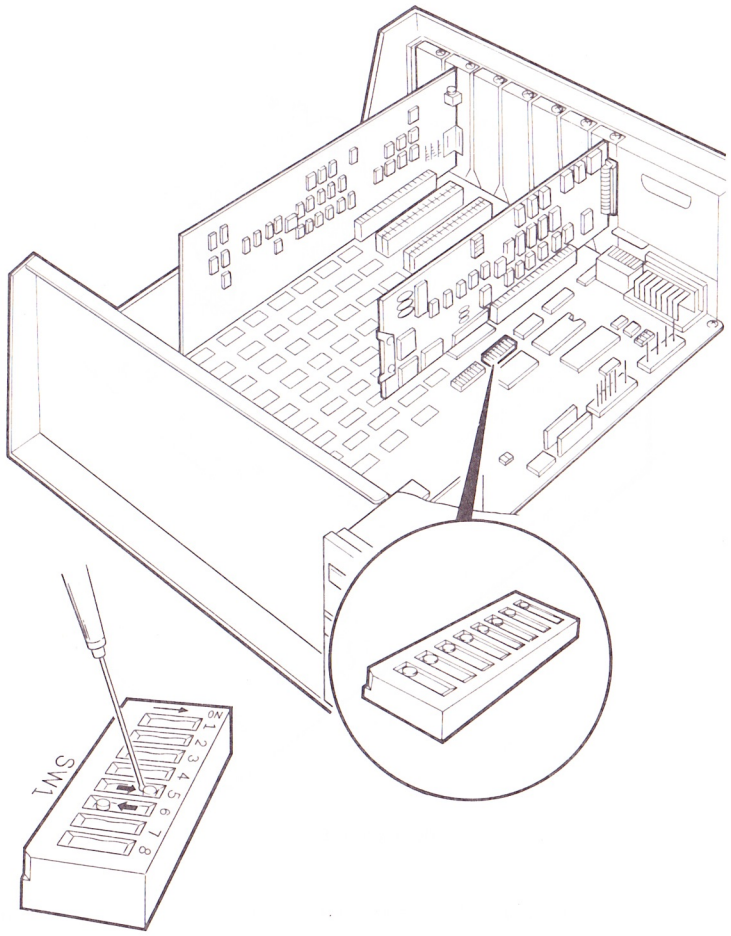

Illustration 6

Set the SW1 switch as indicated in illustration 7:

- When connecting the medium resolution color display or the composite interface display, *or*
- When connecting both the color and monochrome displays to the system unit.

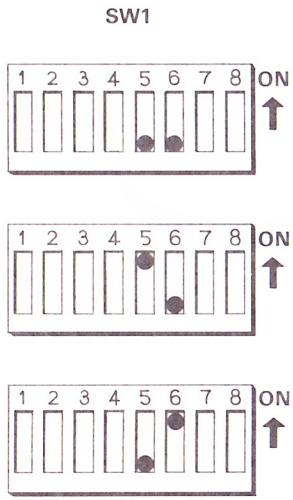
SW1
1 2 3 4 5 6 7 8 ON
Monochrome display or both monochrome and color displays.
1 2 3 4 5 6 7 8 ON
Medium-resolution color display with the medium-resolution color display controller.
1 2 3 4 5 6 7 8 ON
Composite interface display with the color display controller.

Illustration 7

NOTE:

Some software packages may not run correctly using these exact switch settings. A trial and error resetting of the SW1 switch number 4 may solve the problem.

7. Replace the system unit cover by carefully placing the cover over the unit and sliding it towards the rear of the system unit (illustration 8).

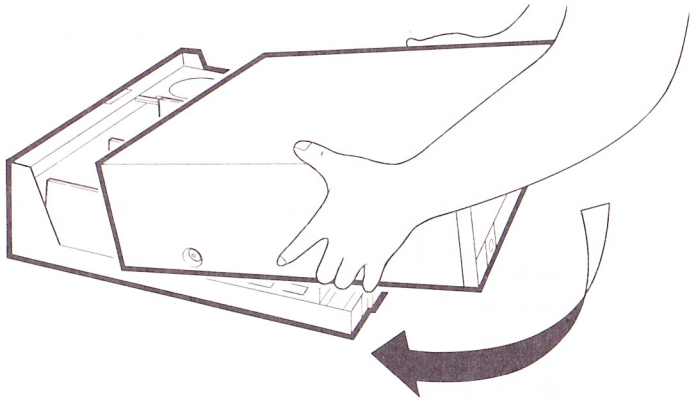

Illustration 8

8. When the cover is back in position, firmly tighten the original 5 screws (2 on each side, 1 at center rear) (illustration 9).

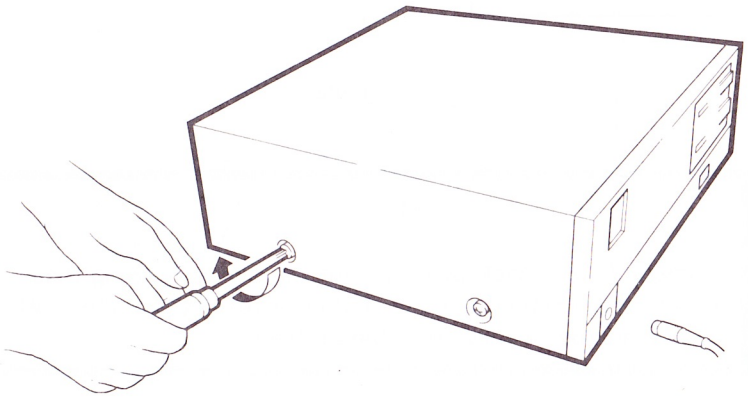

Illustration 9

9. Reconnect all the cables (illustration 10).

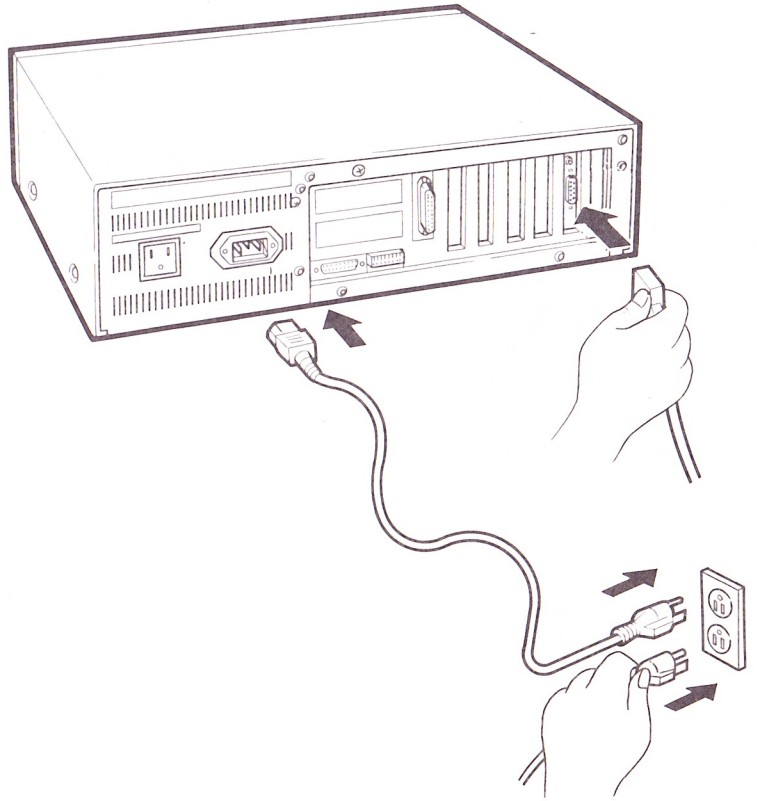

Illustration 10

Your SPERRY Personal Computer is equipped with a UL-approved and CSA-certified 3-prong plug. To avoid electrical shock hazards, make sure that it is only plugged into a properly grounded 3-hole receptacle.

Specifications

1.	Character display:	40 characters by 25 lines 80 characters by 25 lines
2.	Character size:	8 by 8 dots
3.	Graphic display:	320 by 200 dots 640 by 200 dots
4.	Display colors:	16 colors for the medium-resolution display
5.	Display function:	■ Reversed and blinking characters ■ Cursor display
6.	Display time length:	44.7 μsec (horizontal) 12.74 msec (vertical)
7.	Horizontal synchronization frequency:	15.70K Hertz
8.	Vertical synchronization frequency:	59.92 Hertz Non-interlace scanning

Illustration 11 shows the composite interface pin jack and the 9-pin D-shaped connector.

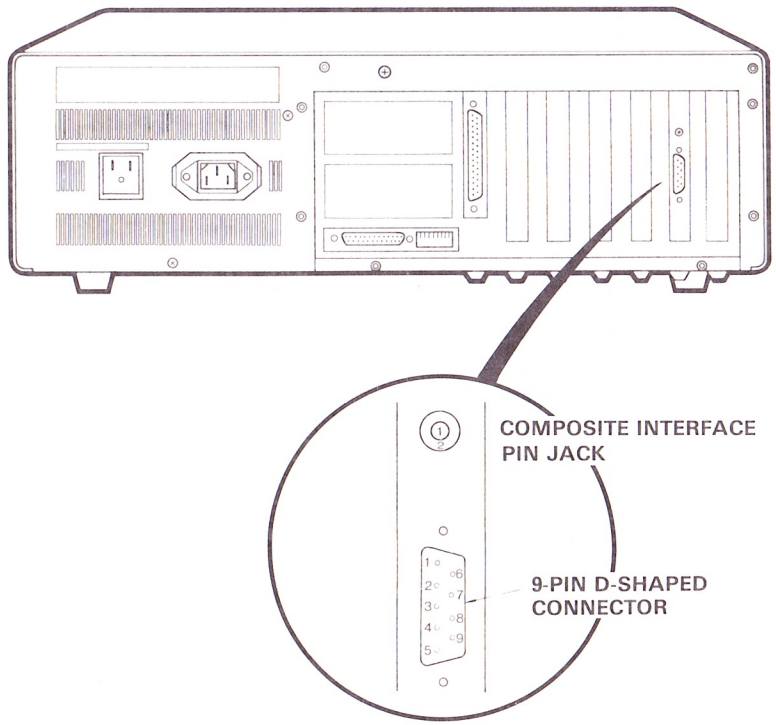

Illustration 11

Composite Interface Pin Jack

	Pin	Signal Name	Direction	
Medium Resolution Color Controller	1	Composite video signal of approximately 1.5 volts peak-to-peak amplitude	→	Composite Interface Display
	2	Ground	—	

Specifications

The following table shows the signal names for the medium resolution color display.*

	Pin	Signal Name	Direction	
Medium-Resolution Color Controller	1	Return for blue and intensity video signals	—	Medium-Resolution Color Display Monitor
	2	Return for both synchronous signals	—	
	3	Red video signal	→	
	4	Green video signal	→	
	5	Blue video signal	→	
	6	Intensity video signal	→	
	7	Return for red and green video signals	—	
	8	Horizontal synchronous signal	→	
	9	Vertical synchronous signals	→	

* All signals are of positive polarity, and have a standard TTL voltage level.

A 4-pin plug attachment is provided (as indicated in illustration 12) for use with an RF modulator.

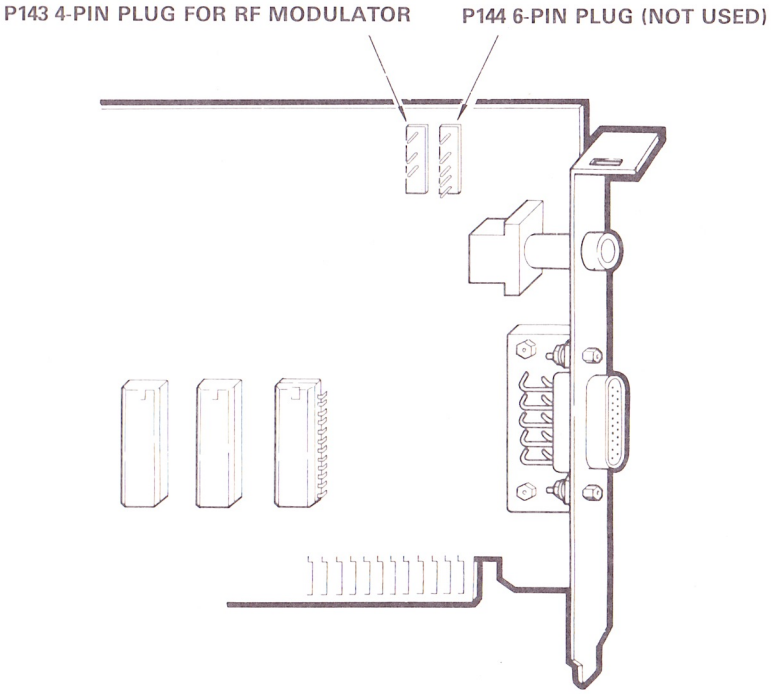

Illustration 12

P143 4-pin Plug Wiring for RF Modulator

	Pin	Signal Name	Direction	
Medium-Resolution Color Controller	1	+ 12 VDC	—	RF Modulator
	2	No connection	—	
	3	Composite video signal of approximately 1.5 volt peak-to-peak amplitude	→	
	4	Ground	—	

Inventory Checklist

The following items should be included in the printer controller package:

- Printer controller board
- Installation guide

If any items are missing or damaged, contact the place of purchase.

This document contains the latest information available at the time of preparation. Therefore, it may contain descriptions of functions not implemented at manual distribution time. To ensure that you have the latest information regarding levels of implementation and functional availability, please consult the appropriate release documentation or contact your local Sperry representative.

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Installation Guide

If you are installing a display monitor controller board, install it before proceeding with this section.

1. Make sure the system unit is unplugged. Place the system unit on a table, so that you have access to both sides.

   Using a Phillips-head screwdriver, remove all five screws (two on each side, one at center rear) from the system unit (illustration 1).

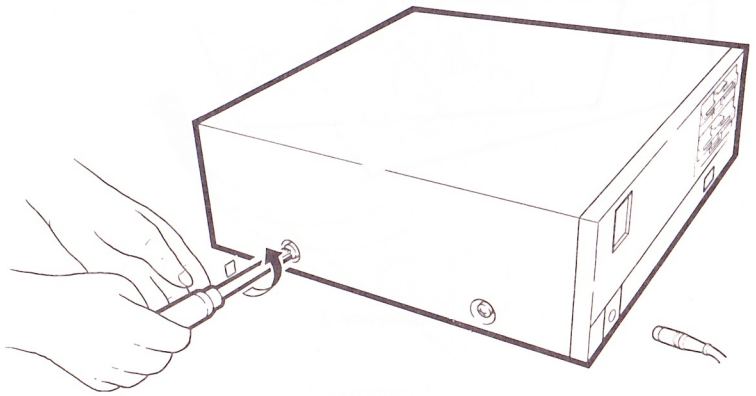

Illustration 1

2. Carefully slide the system unit cover forward from the rear until the cover comes loose from the base—about halfway to the front (illustration 2).

   Tilt and lift the cover from the system unit and set it aside.

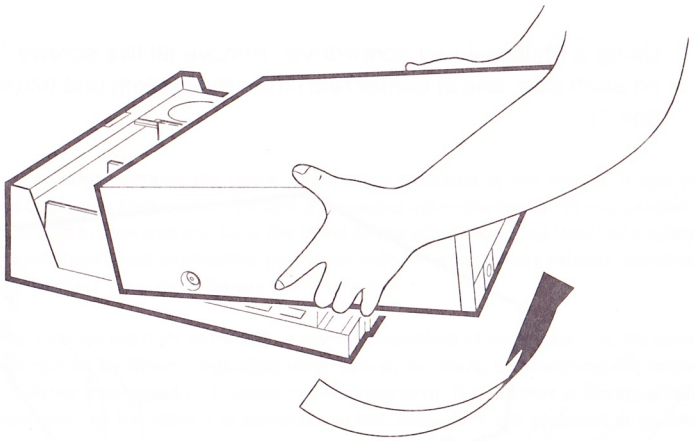

Illustration 2

3. To install the controller board, first remove one of the metal covers at the left rear inside the system unit. (You may use any available slot.)

   Using a Phillips screwdriver, remove the set screw (illustration 3).

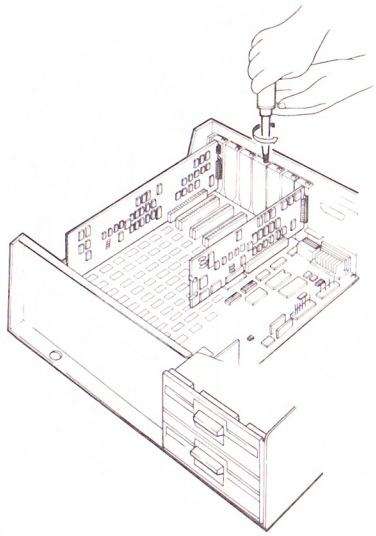

Illustration 3

NOTE:

Some systems have seven expansion slots on the system board, including a slot for the diskette controller board. Other systems place the diskette controller logic components on the system board and eliminate the seventh slot. This Installation Guide illustrates a system containing seven expansion slots with the diskette controller board in the seventh slot. The board described in this Installation Guide may be used with either system.

4. Holding *only* the edges of the plastic controller board (don't touch any of the component parts or wires), carefully push the controller board straight down so that the bottom edge locks firmly into the guide track on the floor of the system unit (illustration 4).

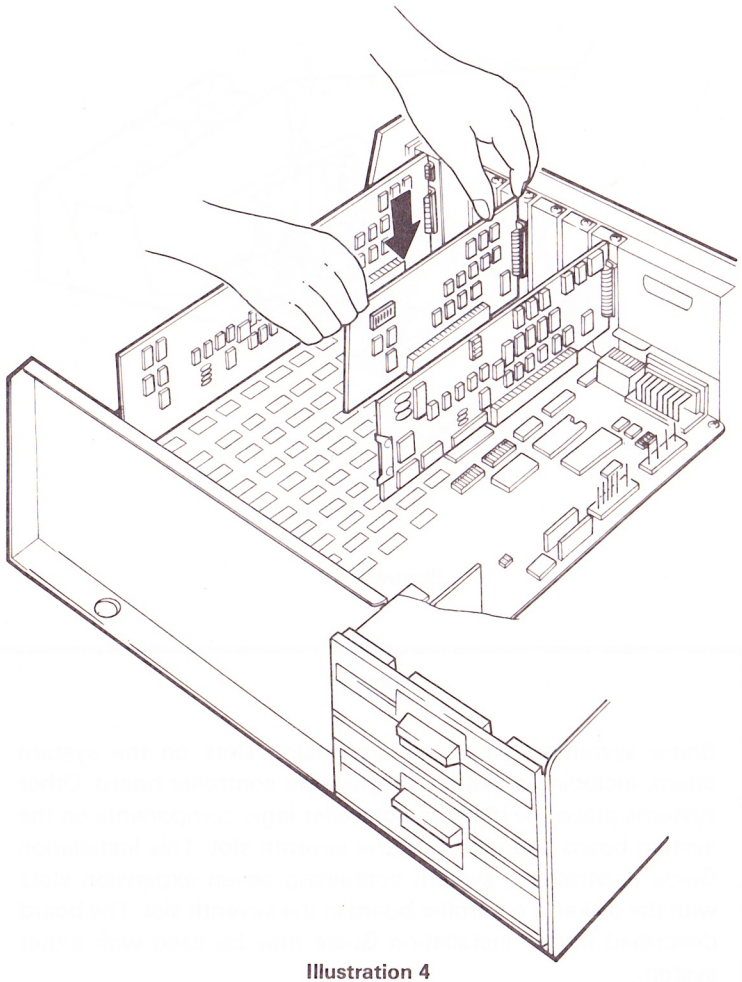

Illustration 4

5. Locate the controller identification switch using illustration 5.

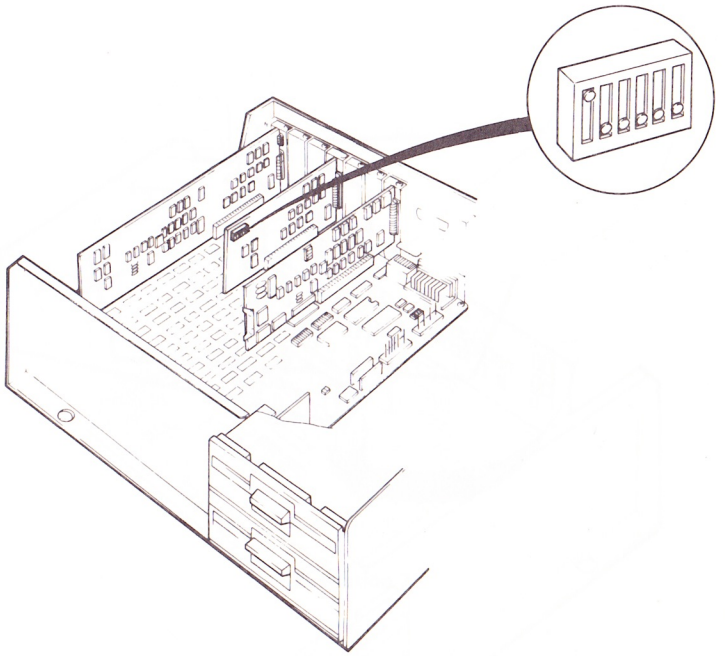

Illustration 5

6. Set the printer controller identification switch as indicated in the table below. (Two printer controller boards may be installed simultaneously.)

SW1-2	SW1-1	Installed Controller Boards	Port (Address)
0	1	1	X'0378'
0	0	2	X'0278'

NOTE: 0 is OFF; 1 is ON.

7. Using the original screw, firmly tighten the new cover plate (with the plug in it) at the rear of the system unit (illustration 6).

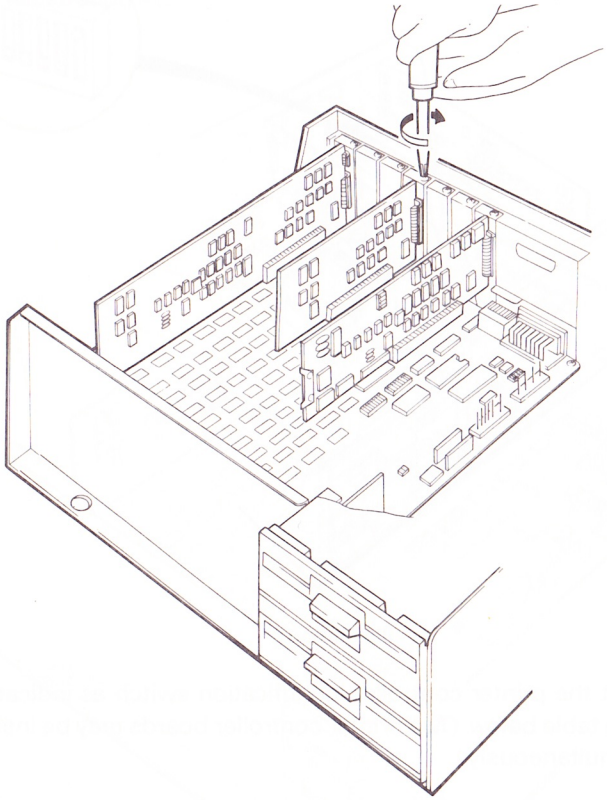

Illustration 6

If you have other controller boards to install, you may want to install them before replacing the system unit cover. Refer to the specific installation instructions included with the other boards.

8. To replace the system unit cover, carefully place the cover over the unit, and slide it towards the rear of the system unit (illustration 7).

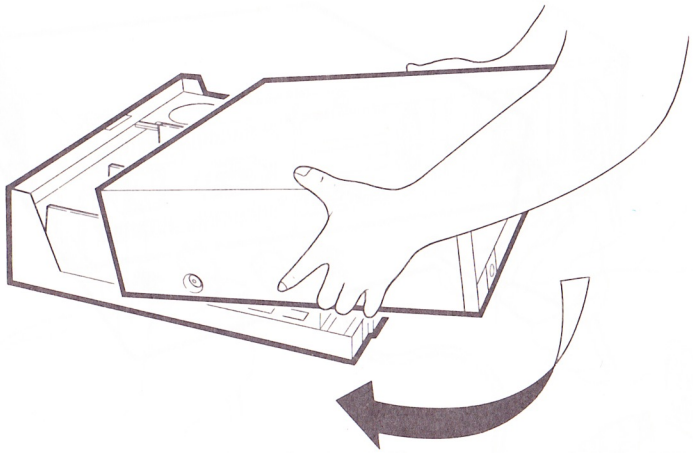

Illustration 7

9. When the cover is back in position, firmly tighten the original five screws (two on each side, one at center rear) (illustration 8).

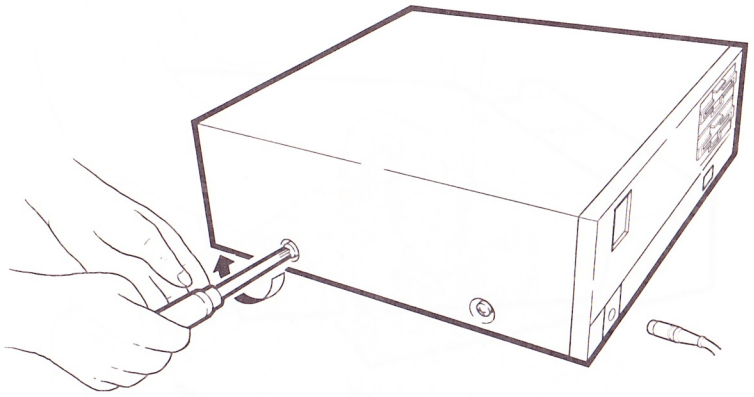

Illustration 8

10. Reconnect all the cables (illustration 9).

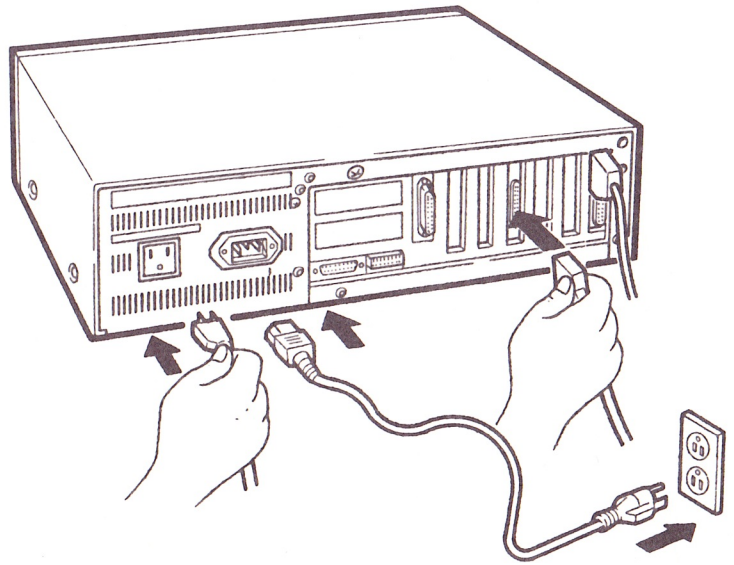

Illustration 9

Your SPERRY Personal Computer is equipped with a UL-approved, CSA-certified, 3-pronged plug. To avoid electrical shock, make sure that it is only plugged into a properly grounded 3-hole receptacle.

NOTE:

Only the monochrome display monitor should be plugged into the system unit. If you are using a color display monitor, it should be connected to a separate electrical outlet.

Inventory Checklist

The following items should be included in the diskette drive controller board package:

- Diskette drive controller board
- Installation guide

If any items are missing or damaged, contact the place of purchase.

NOTE:

The diskette controller comes installed in the system unit, but this guide will help in the event that the diskette controller must be removed or replaced.

Installation Guide

If you are installing a display monitor, install that controller board first.

1. Make sure the system unit is unplugged. Place the system unit on a table, so that you have access to both sides.

   Using a Phillips-head screwdriver, remove all 5 screws (2 on each side, 1 at center rear) from the system unit (illustration 1).

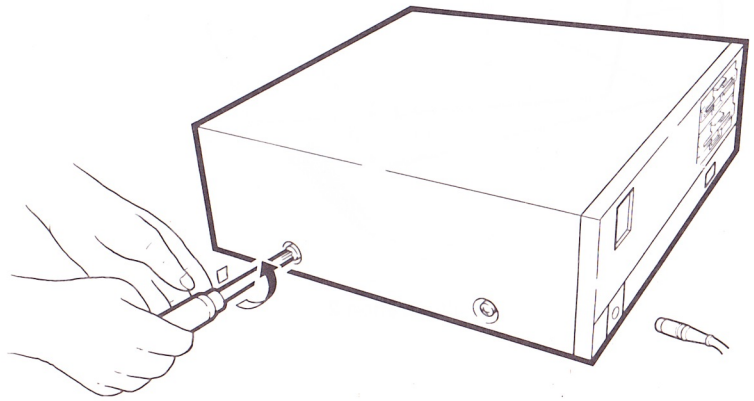

Illustration 1

2. Carefully slide the system unit cover forward from the rear until the cover comes loose from the base – about halfway to the front (illustration 2).

   Tilt and lift the cover from the system unit and set it aside.

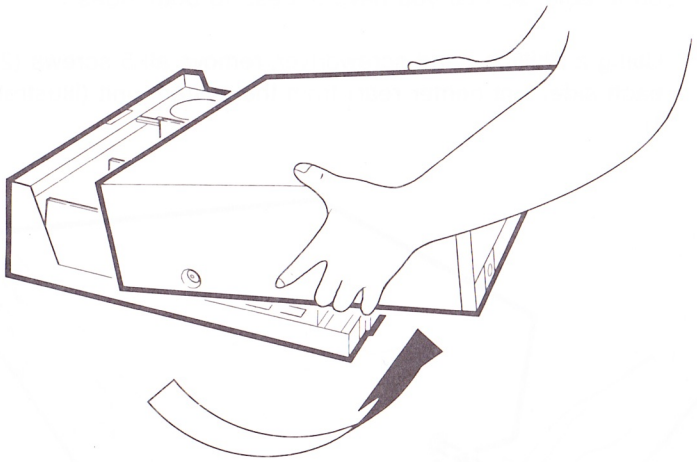

Illustration 2

3. To install the controller board, first remove the metal cover from the last slot at the right rear inside the system unit.

   Using a Phillips screwdriver, remove the set-screw (illustration 3).

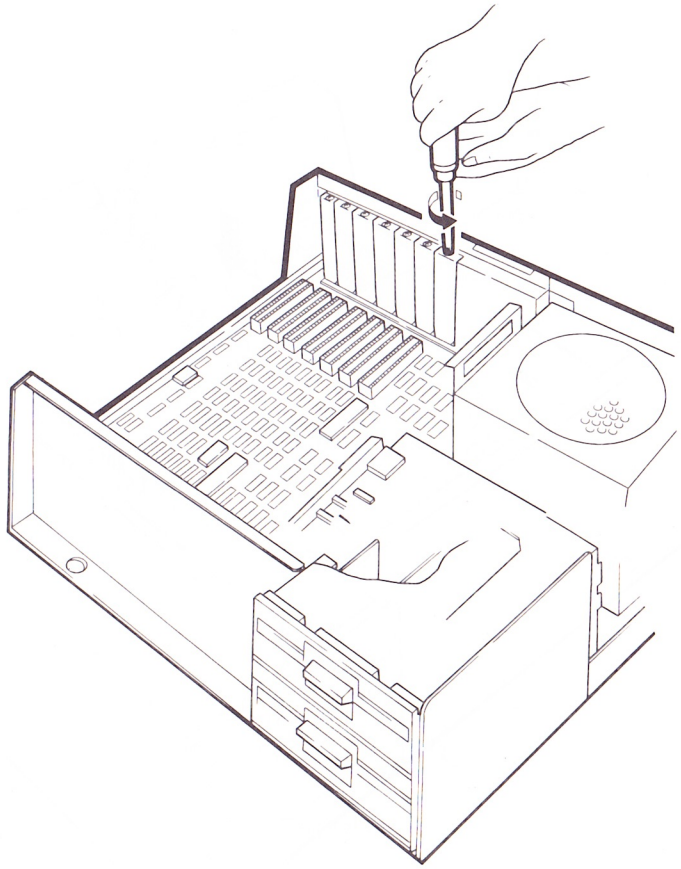

Illustration 3

4. Holding *only* the edges of the plastic controller board (don't touch any of the component parts or wires), carefully push the controller board straight down so that the bottom edge locks firmly into the guide track on the floor of the system unit (illustration 4).

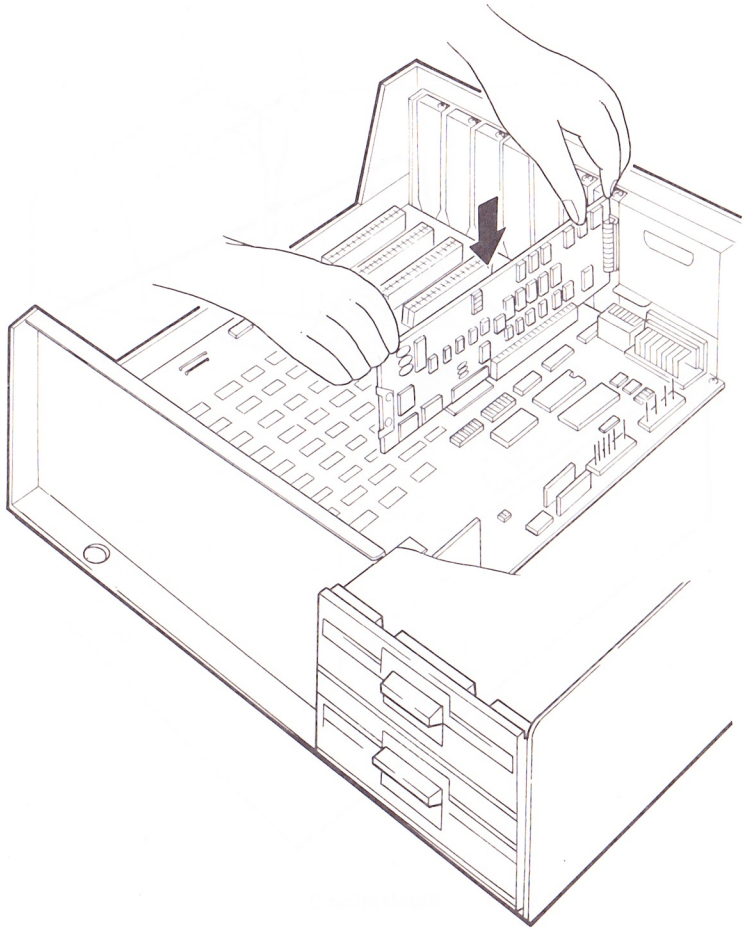

Illustration 4

5. Using the original screw, firmly tighten the new cover plate (with the plug in it) at the rear of the system unit (illustration 5).

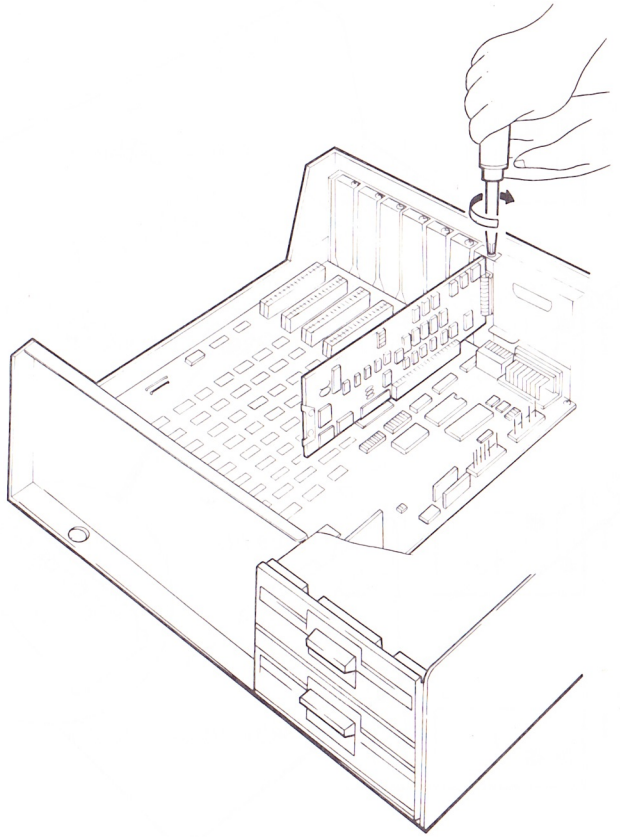

Illustration 5

If you have other controller boards to install, you may want to install them before replacing the system unit cover. Refer to the specific installation instructions included with the controller boards.

6. Locate the SW1 switch on the system board according to illustration 6.

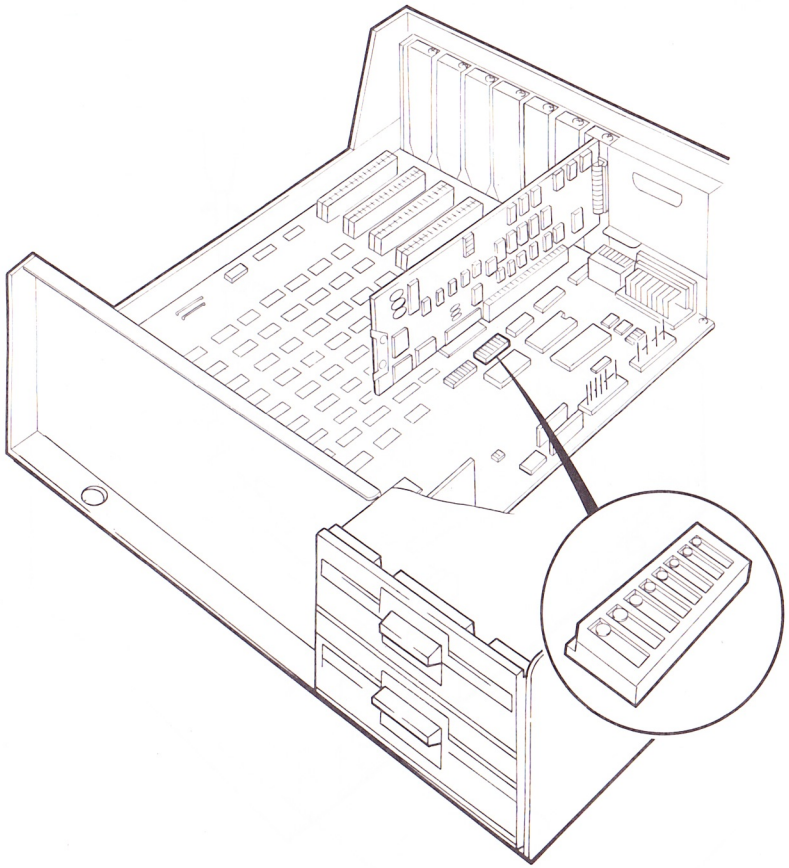

Illustration 6

Set the SW1 switch to match the number of diskette drives you are going to use (illustration 7).

Use something with a fairly sharp point (like a ballpoint pen or very small screwdriver) to flip the switches.

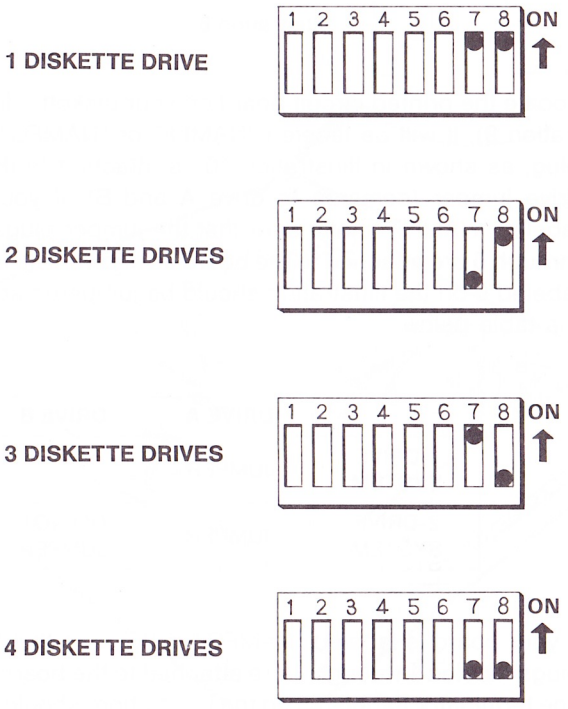

Illustration 7

Set the switches on the diskette controller board as shown in illustration 8:

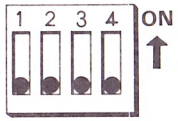

Illustration 8

7. Locate the printed circuit board on your diskette drives (illustration 9). It will be labeled "NAMFF" or "NAMFG." A jumper plug, as shown in illustration 10, is attached to the diskette drive jumper (common to drive A and B). If your board is labeled "NAMFF," make sure that the jumper plugs labeled 1 through 5 are attached to the board as shown. The terminators labeled 6 on the illustration should be jumpered according to the table below.

	DRIVE A	DRIVE B
1-DRIVE SYSTEM	JUMPER	
2-DRIVE SYSTEM	JUMPER	DO NOT JUMPER

If your board is labeled "NAMFG," make sure that the jumper plugs labeled 1 through 4 are attached to the board as shown. The terminator (labeled 5 on the illustration) should be mounted on the IC socket according to the table below.

	DRIVE A	DRIVE B
1-DRIVE SYSTEM	MOUNT	
2-DRIVE SYSTEM	MOUNT	DO NOT MOUNT

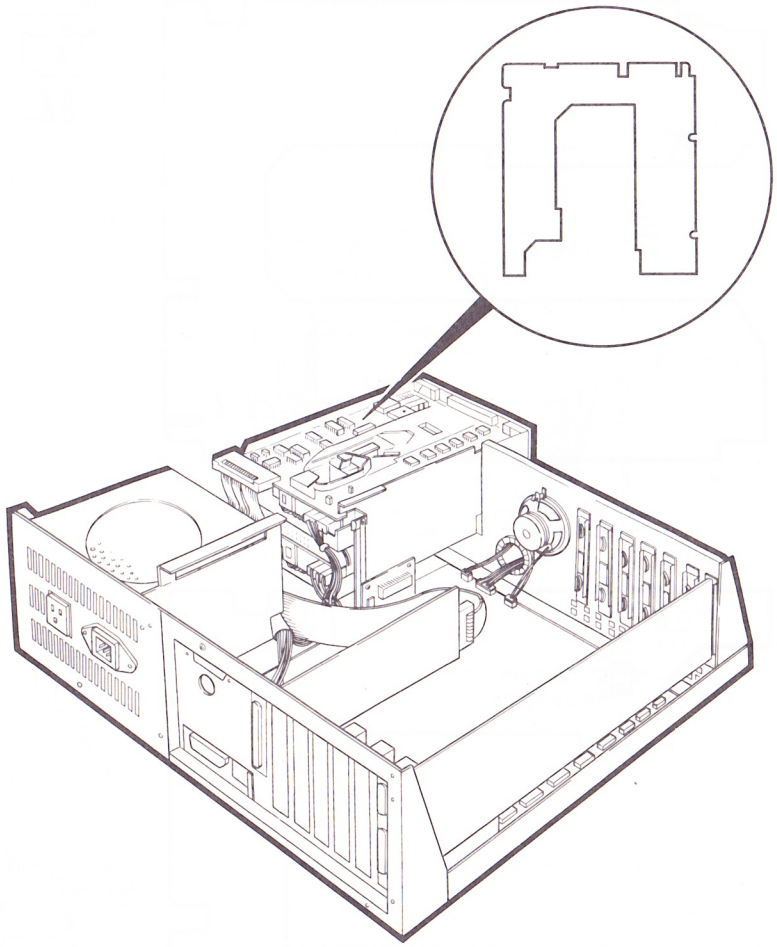

Illustration 9

7.

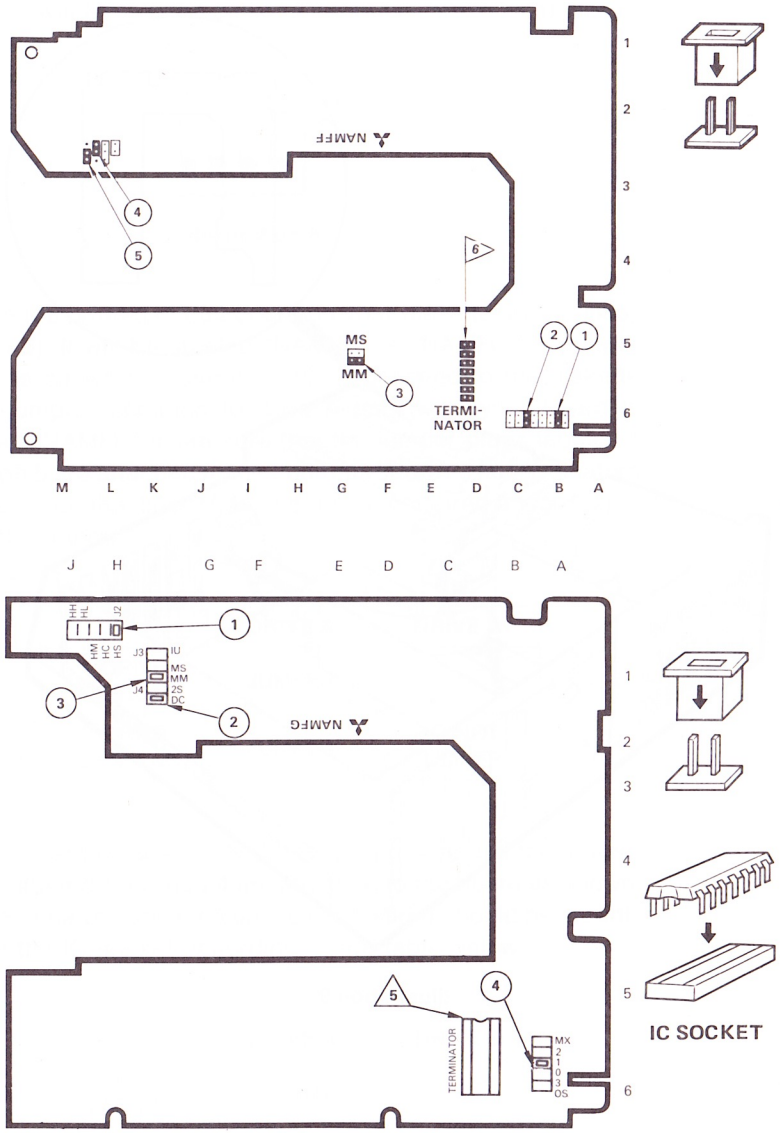

Illustration 10

7. OPTIONS

8. Supply power to the diskette drive using the DC power connectors (illustration 11).

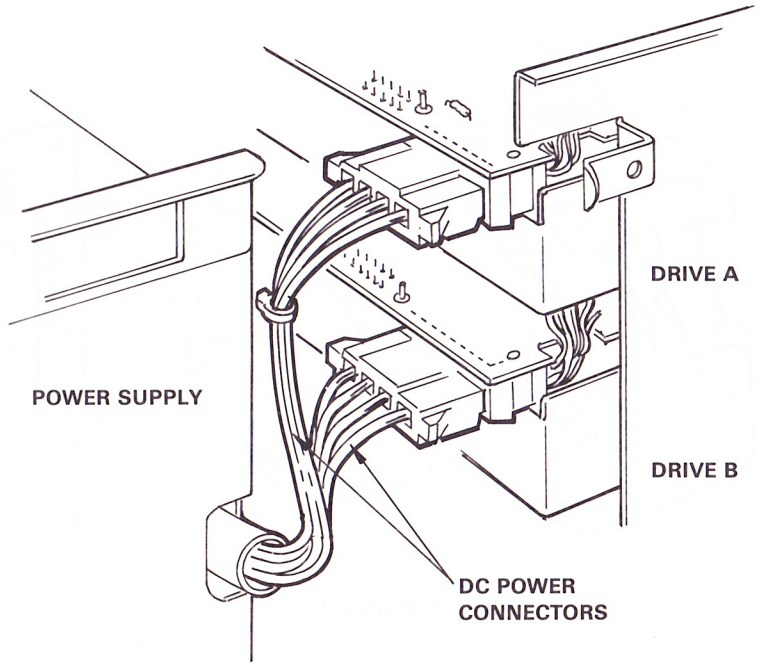

Illustration 11

NOTE:

This illustration is for a 2-drive system. No power supply to drive B is needed if only one drive is used.

7. OPTIONS

9. Connect the connector inside the controller to the drives (illustration 12).

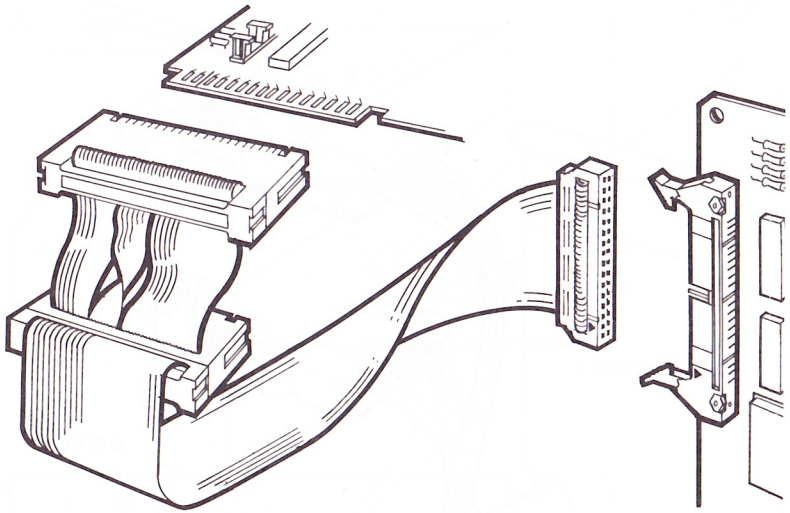

Illustration 12

NOTE:

This illustration is for a 2-drive system. If only one drive is used, no connection to drive B is needed.

10. Replace the system unit cover by carefully placing the cover over the unit and sliding it towards the rear of the system unit (illustration 13).

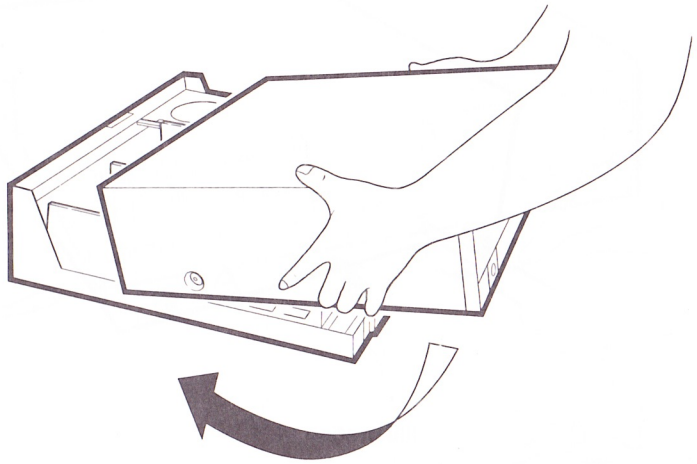

Illustration 13

11. When the cover is back in position, firmly tighten the original 5 screws (2 on each side, 1 at center rear) (illustration 14).

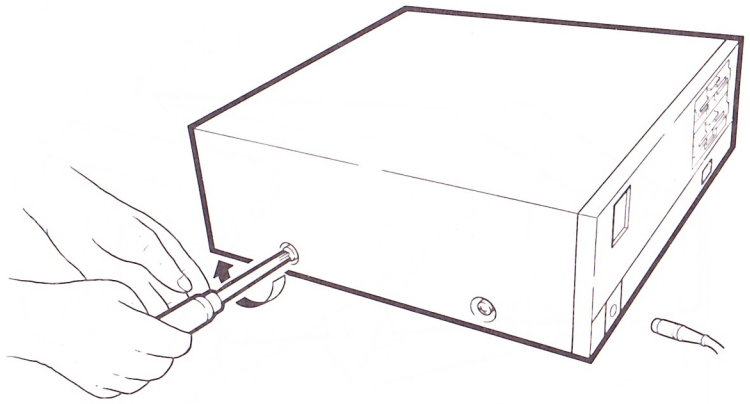

Illustration 14

12. Reconnect all the cables (illustration 15).

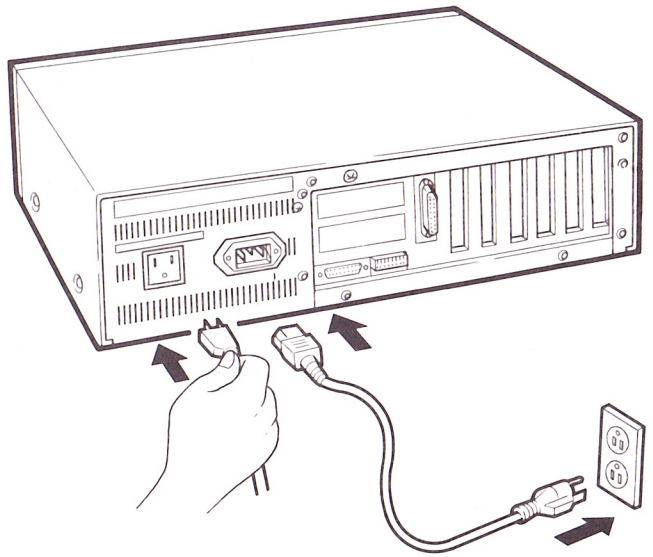

Illustration 15

Your SPERRY Personal Computer is equipped with a UL-approved, CSA-certified, 3-pronged plug. To avoid electrical shock hazards, make sure that it is only plugged into a properly grounded 3-hole receptacle.

Interface Signals

All signals are of positive polarity and have standard TTL voltage level.

	Pin	Signal Name	Direction	
Medium-Resolution Color Controller	1	Return for blue and intensity video signals	—	Medium-Resolution Color Display Monitor
	2	Return for both synchronous signals	—	
	3	Red video signal	→	
	4	Green video signal	→	
	5	Blue video signal	→	
	6	Intensity video signal	→	
	7	Return for red and green video signals	—	
	8	Horizontal synchronous signal	→	
	9	Vertical synchronous signal	→	

Inventory Checklist

The following items should be included in the medium resolution color display monitor package:

- Medium-resolution color display monitor
- Medium-resolution color display monitor booklet

If any items are missing or damaged, contact the place of purchase.

7. MONITOR

SPERRY

Personal Computer System
Medium Resolution
Color Display Monitor
UP-10516

This document contains the latest information available at the time of preparation. Therefore, it may contain descriptions of functions not implemented at manual distribution time. To ensure that you have the latest information regarding levels of implementation and functional availability, please consult the appropriate release documentation or contact your local Sperry representative.

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The statement below is included in this manual to comply with a Federal Communications Commission (FCC) Regulation. The FCC is an agency of the United States government; thus, the statement below applies to computing equipment installed in the United States of America. Sperry is taking appropriate steps to be in compliance with FCC regulations and similar regulations of other countries.

WARNING: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems".

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

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Medium Resolution Color Display Monitor

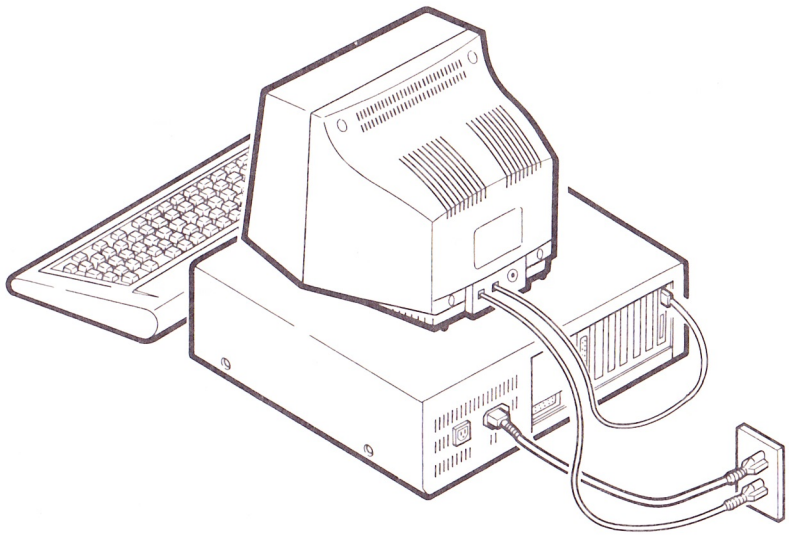
Installation

Place the display monitor near or on top of the system unit. Connect the two cables from the display monitor as shown in the illustration below. Plug the power cord (the one with the 3-prong plug) into a separate electrical outlet.

NOTE:

The color display monitor should not be plugged into the receptacle on the rear of the system unit. It should be plugged into a separate 110/120 volt AC outlet. The receptacle on the system unit is for monochrome monitors only.

The other cable from the display monitor (the one with the 9-pin, D-shaped plug) plugs into the receptacle on the right side of the back of the system unit. You can screw in the two small screws on each end of the plug; this will keep the plug firmly in place.



Description

The medium-resolution color display monitor is connected to the medium-resolution color display controller board.

The color display controller board must be installed before you use the color display monitor. Refer to the medium-resolution color controller installation guide.

CAUTION: HIGH VOLTAGE

Do not try to open the display terminal casing. There are no serviceable parts inside.

The color display monitor has a power switch, a power-on indicator light, 3 thumbwheel controls, and a tilt lever (illustration 1).

Adjust the brightness and contrast of the display by rotating the CONTRAST and BRIGHT controls.

If you need to center the display, rotate the CENTER control.

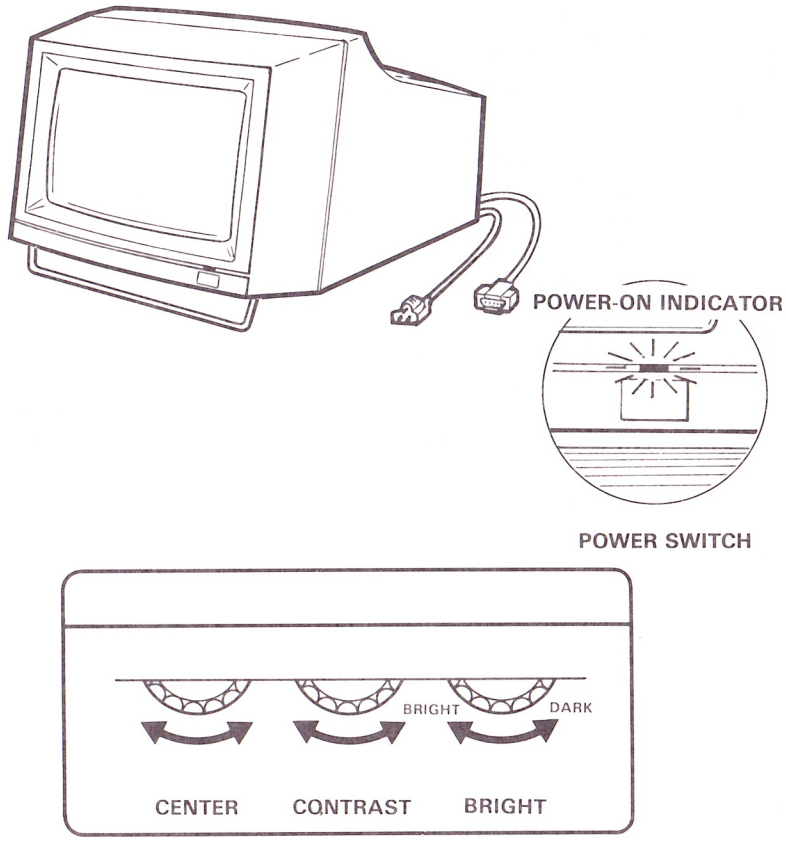
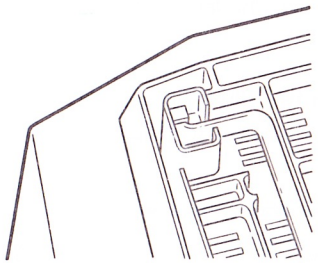


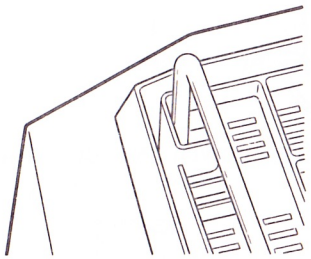
Illustration 1

Description

The angle of the color monitor may be adjusted with the tilt lever (illustration 2).



When the stand is level, the set is viewed at a 100° angle.



For the set to be viewed at a 105° angle, adjust the tilt stand into the groove.

Illustration 2

Specifications

1.	CRT tube:	14 inches, nonglare
2.	Displayed colors:	16 colors
3.	Resolution:	640 by 200 dots
4.	Character display:	40 characters by 25 lines (Non-interface scanning only) 80 characters by 25 lines
5.	Display time:	44.7 μsec (horizontal) 12.74 msec (vertical)
6.	Horizontal cycle frequency:	15.70K Hertz
7.	Vertical cycle frequency:	59.92 Hertz Non-interlace scanning
8.	Controls and indicators:	Power switch, power-on indicator light, brightness, contrast, and centering thumbwheel controls, tilt lever
9.	Ambient conditions:	Temperature 5°C ~ 32°C Humidity 20 ~ 80%
10.	Cables:	Signal cable 1.5 m Power cable 1.8 m
11.	Power source:	120 VAC 60 Hz
12.	Electricity use:	70 W
13.	Dimensions:	Width 35.0 cm Depth 40.6 cm Height 32.2 cm
14.	Weight:	11.2 kg

Inventory Checklist

The following items should be included in the keyboard package.

- Keyboard
- Inventory checklist

If any items are missing or damaged, contact the place of purchase.

For keyboard installation instructions, refer to Chapter 2 of the Operator's Guide.

Inventory Checklist

- SPERRY Enhanced Keyboard
- Installation Guide

If any of the above items are missing or damaged, contact the place of purchase immediately.

This document contains the latest information available at the time of preparation. Therefore, it may contain descriptions of functions not implemented at manual distribution time. To ensure that you have the latest information regarding levels of implementation and functional availability, please consult the appropriate release documentation or contact your local Sperry representative.

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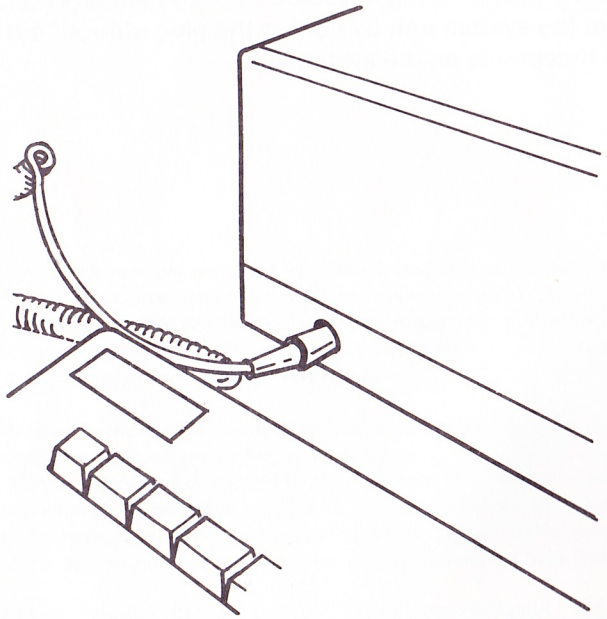
Installation

1. Make sure that the power to the system unit is off.

2. Unplug your existing keyboard (if one is already installed) from the system unit by pulling the plug straight out from the receptacle on the system unit.

3. Plug in your SPERRY Enhanced Keyboard. This keyboard is a direct replacement for the standard keyboard and requires no modification of the system unit or software.



4. Turn on the power to the system unit. Your SPERRY Enhanced Keyboard is now ready for use.

   See the following sections on "New Features" and "Operation" for more information on using your new keyboard.

New Features

The SPERRY Enhanced Keyboard was designed to make your SPERRY Computer System even easier and more convenient to use than it already was.

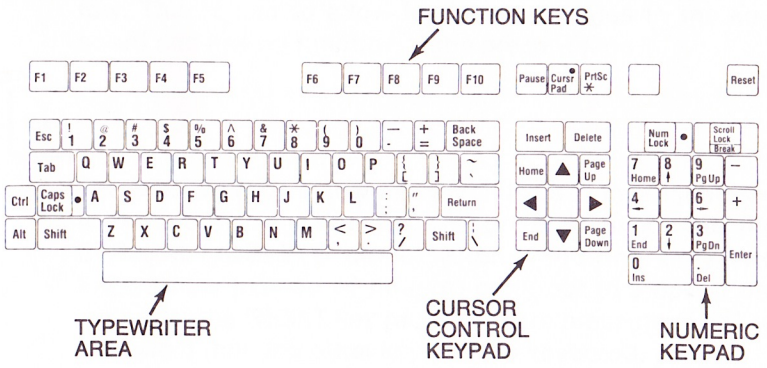
The keyboard layout has been changed to allow greater functionality and ease-of-use. The function keys have been repositioned along the top of the keyboard and a cursor control pad has been added between the Typewriter area of the keyboard and the numeric keypad. The numeric keypad still retains its dual function as either a numeric keypad or a cursor control keypad. With this new arrangement, when cursor control capability is switched off on the numeric pad, the cursor control pad then provides cursor control capability.

Several keys have been reshaped or repositioned, and a PAUSE key and a RESET key added.

These changes are explained in detail in the next section.

Operation

The keyboard is divided into four areas: the Function Keys, the Typewriter area, the Cursor Control Keypad and the Numeric Keypad.



Typewriter Area

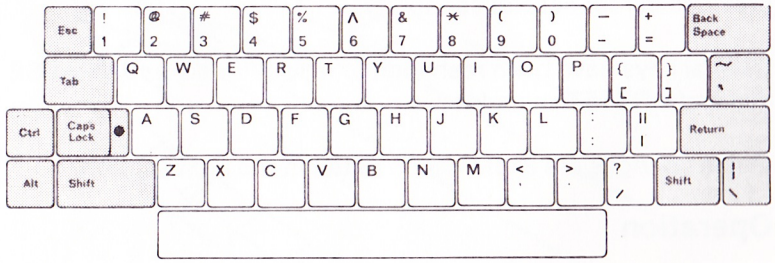
Note that there are some differences between the Typewriter area on your SPERRY Enhanced Keyboard and the original keyboard.

The CAPS LOCK key has been repositioned.

The ALT key has been moved up next to the SHIFT key.

The SHIFT key on the left has been widened.

The BACKSLASH key has been repositioned.



Function Keys

All of the function keys (F1 through F10) have been relocated along the top of the keyboard. In addition there are three new keys (plus one non-functioning key) and one relocated key as described below.

PAUSE is a new key which duplicates the CTRL/NUM LOCK operation.

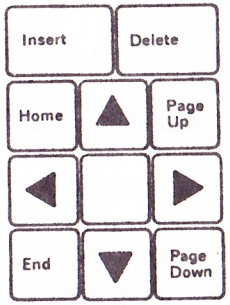
The CURSR PAD key is a new toggle (press ON/press OFF) key which simultaneously activates the Cursor Control Keypad and Numeric Keypad. An LED indicator on the key glows when the Cursor Control Keypad is activated and the Numeric Keypad is locked into the numeric mode.

The PRINT SCREEN key is repositioned, but functions in the same manner as before.
Note that there is a NON-FUNCTIONING key along the top row. This is just to allow for future changes to the keyboard and has no function at the present time.

The RESET key is a new key which is used in conjunction with the CTRL key. Pressing CTRL/RESET duplicates the CTRL/ALT/DELETE combination, requiring only two fingers now instead of three to carry out this operation. Note that the RESET key requires more pressure (6 oz.) to activate it than the other keys on the keyboard.

Numeric Keypad

The Numeric Keypad has been shifted to the right. Other than some minor size and position changes, these keys remain much the same as on the standard keyboard.



Cursor Control Keypad

This new keypad is controlled by the CURSR PAD key at the top of the keyboard. The status of the Cursor Pad is indicated by the LED on the CURSR PAD key (LED ON = Cursor Pad ON). The default status on power up is inactive (LED = OFF) and that the cursors/numbers are available on the Numeric Keypad. Pressing the CURSR PAD key activates the Cursor Control Keypad and engages NUM LOCK (LED = ON). Cursors are then available on the Cursor Control Keypad and numbers only on the Numeric Keypad. The NUM LOCK cannot be disengaged while the Cursor Pad Keypad is active.

Technical Data

The following information is for the convenience of the technically-oriented user. Most users will not need to reference this data.

Power Requirement

+5 VDC @ 500ma. Maximum

Interface Protocol

Protocol is Serial TTL

Keyboard

The keyboard has an attached cable that connects to a DIN connector on the system unit. This is a shielded five-wire cable containing +5 VDC, two signal lines, a reset line and a ground line.

Key switches are capacitive type, with a microprocessor performing the keyboard scanning.

Standard N-key rollover. All keys are down/up coded. The keyboard returns scan codes rather than ASCII codes. As an example, key #1 (the F1 key) produces scan hex code 3B on make (pressing) and hex code BB on break (releasing). Break codes are formed by adding hex 80 to the make codes. The keyboard I/O driver can define keyboard keys as shift keys or typematic, as required by the application program.

The microprocessor in the keyboard provides keyswitch scanning, maintains serial communications with the host computer, and executes handshake protocol required by each scan code transfer.

Cursor Control Application Notes

Keys in the Cursor Pad are enabled/disabled by the CURSR PAD key (Key 12). When enabled, and NUM LOCK LED is ON, there is a special protocol for changing from the Typewriter area to the keypad, which is output as follows:

1. Assuming that the keyboard is powered-up and the CURSR PAD key is activated (LED is ON), the first key pressed in the Cursor Pad area will generate a "2A" hex code just prior to its own code. All subsequent keys in the Cursor Pad output their key codes alone.

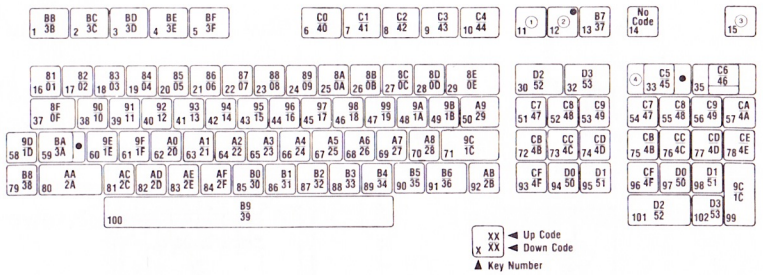
2. After one or more keys have been pressed in the Cursor Pad area, returning to the Typewriter area or to the Numeric Pad causes the code "AA" to precede the first key pressed. Subsequent keys output their key codes alone.

3. Now, pressing a key in the Cursor Pad area acts as in step 1, above.

Therefore, whenever you change from the Typewriter area or the Numeric Pad to the Cursor Pad (or back again), an additional code is output before the first key in the new area.

The above protocol is not operational if either SHIFT key is being held, or if either the NUM LOCK or CURSR PAD LED is OFF.

Keyboard Scan Codes



Notes on scan codes:

1. Key #11 (PAUSE) will generate the sequential code string "1D,45,C5,9D" only when depressed. There is no keycode on release.

2. IF the CURSR PAD LED is ON, the Cursor Keypad is activated and the keys generate the indicated hex codes in accordance with the Cursor Control Application Note.

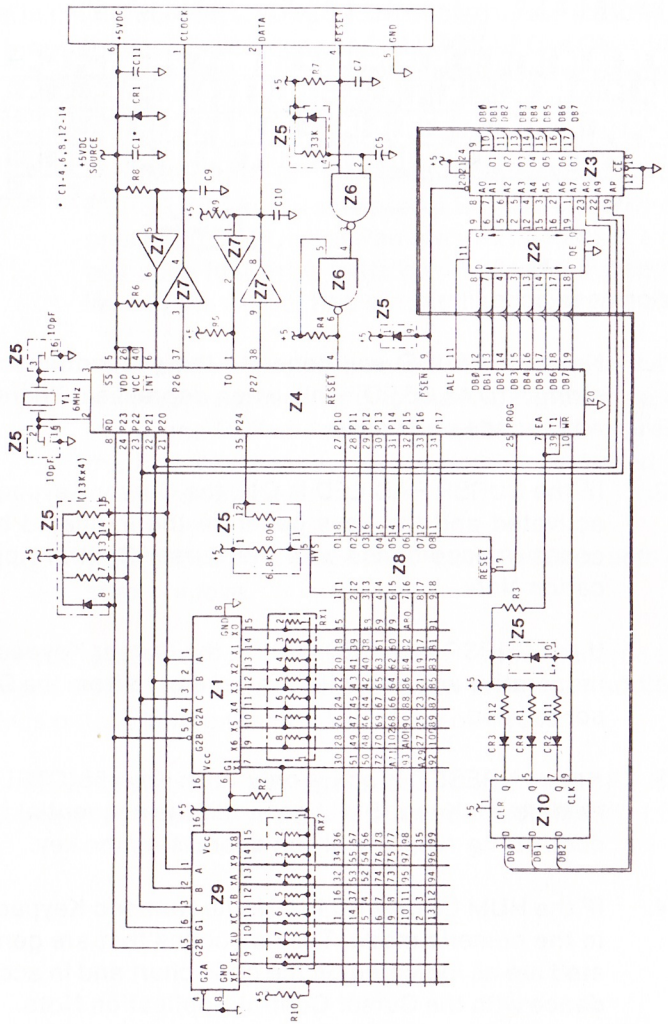
   If the CURSR PAD LED is OFF, the Cursor Keypad is inoperative and no codes are generated from the Cursor Keypad.

3. Key #15 (RESET) is active only when Key #58 (CTRL) is held down. Key #15 will generate the sequential hex code string "38,53" only on depressing the key.

4. IF the NUM LOCK LED is ON, the Numeric Keypad is in the numeric mode. The hex codes that are generated are as indicated on the code chart and in accordance with the Cursor Control Application Note.

   If the NUM LOCK is OFF, the Numeric Keypad is in the cursor mode. The hex codes generated are as indicated on the code chart.

Schematic Diagram



Keyboard Interface Connector

Function	Voltage	Pins
Keyboard Clock	TTL	1
Keyboard Data	TTL	2
Keyboard Reset	0	3
Ground	0	4
Power Supply	+5 VDC	5

5 Pin DIN at System Unit

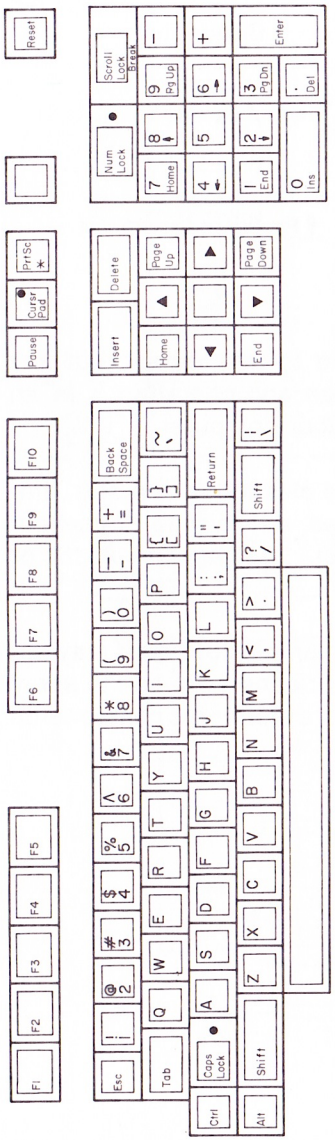
Maintenance

Your SPERRY keyboard is designed to operate without any maintenance, except keeping it clean and operating it in an environment which is suitable for your computer

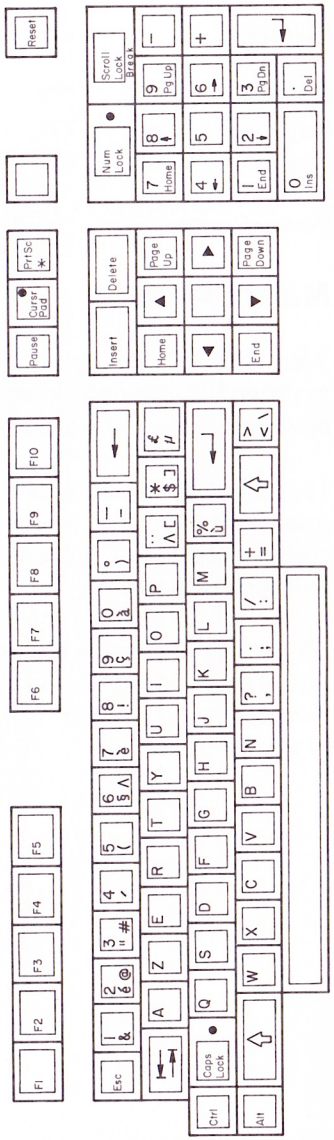
The exterior of the keyboard may be cleaned with a soft, lint-free cloth or paper towel, dampened with a mild household cleaner. Never use solvents which could damage the plastic or painted surfaces.

Do not use excessive liquid on the cleaning cloth, as it may run into the keyboard. Do not use spray cleaners, since the spray may penetrate beyond the keys into the electronic components of the keyboard.

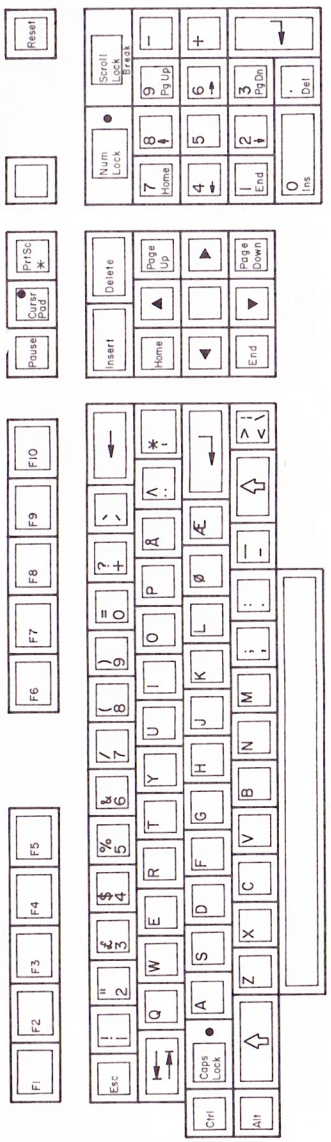
Keyboards



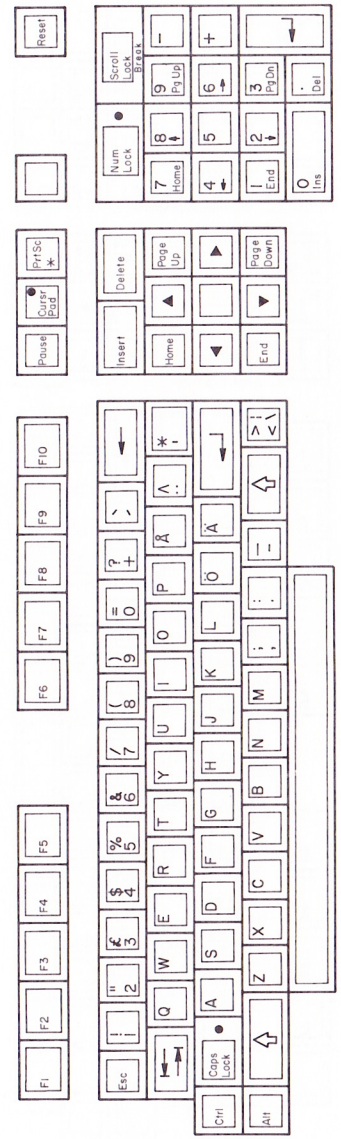
USA



French

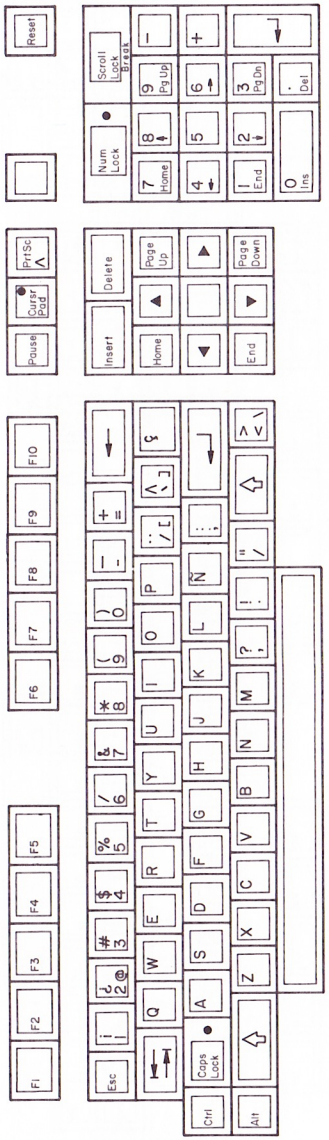


Norwegian

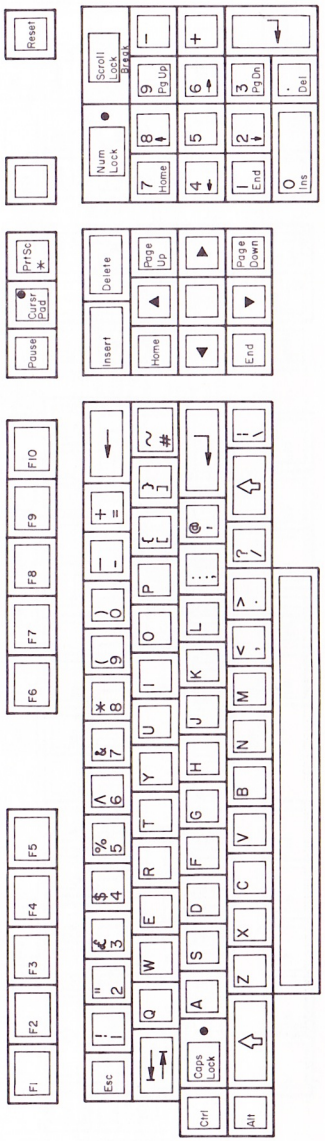


Swedish

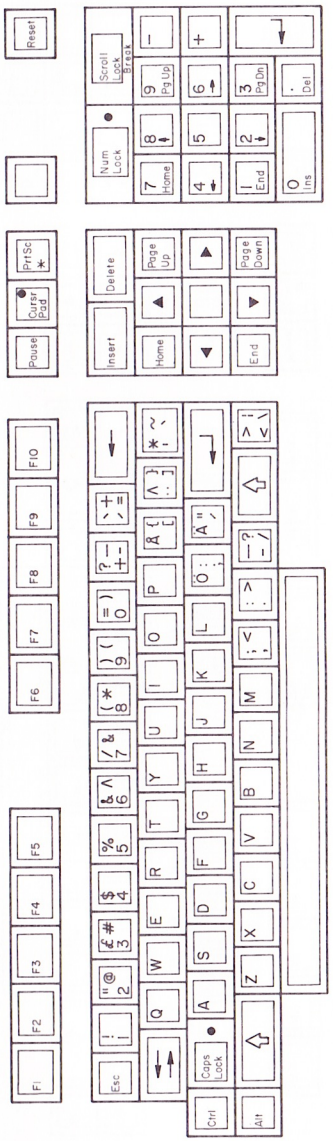
Keyboards



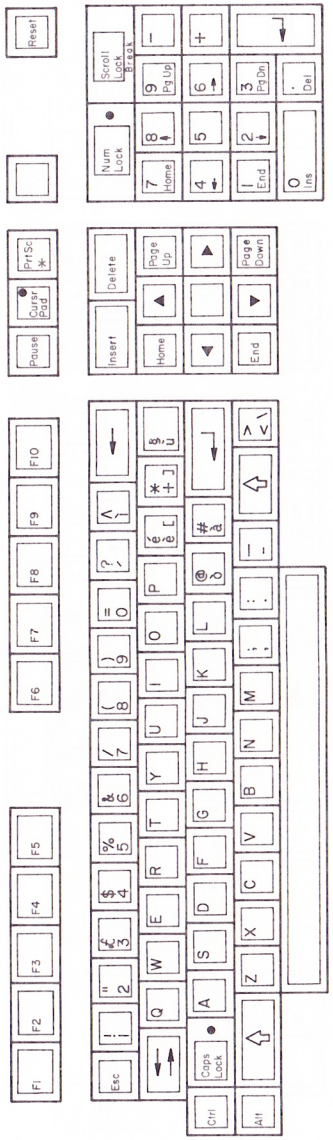
Spanish



United Kingdom



Finnish



Italian

Keyboards

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10
Pause Curs Pad PrtSc
Reset
Num Lock Scroll Lock Break
Insert Delete Home Page Up Page Down End
Esc Caps Lock Ctrl Alt

Danish

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10
Pause Curs Pad PrtSc
Reset
Num Lock Scroll Lock Break
Insert Delete Home Page Up Page Down End
Esc Caps Lock Ctrl Alt

German

Inventory Checklist

The following items should be included in the Model 5 printer package:

- Model 5 printer
- Separator
- Ribbon cartridge
- Power cord (European type only)
- User's guide, "Using the Model 5 Printer," UP-10255

If any items are missing or damaged, contact the place of purchase.

Installation

1. Install the printer on a flat, firm surface with enough space to operate it.

   Refer to the printer user's guide for information on environmental requirements.

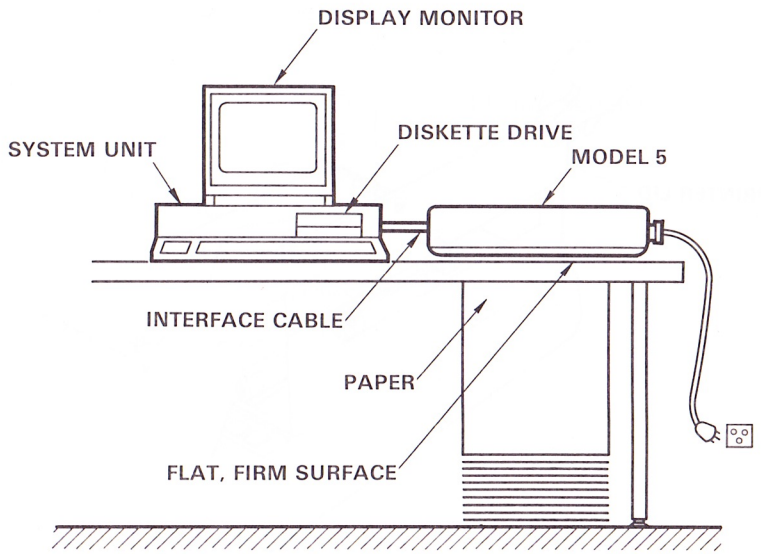


Illustration 1

2. Remove the protective paper.

   The printer is shipped with a sheet of protective paper. This paper is inserted to prevent damage from shocks or vibrations.

   If you reship the printer, reinsert this paper.

3. Lift the printer lid upward and off.

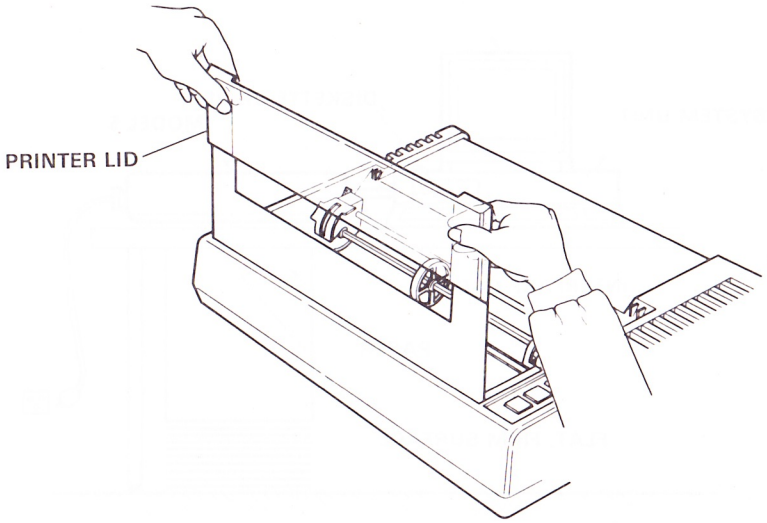


Illustration 2

4. Stand the printer on its left side and remove the two shipping screws on the bottom of the case.

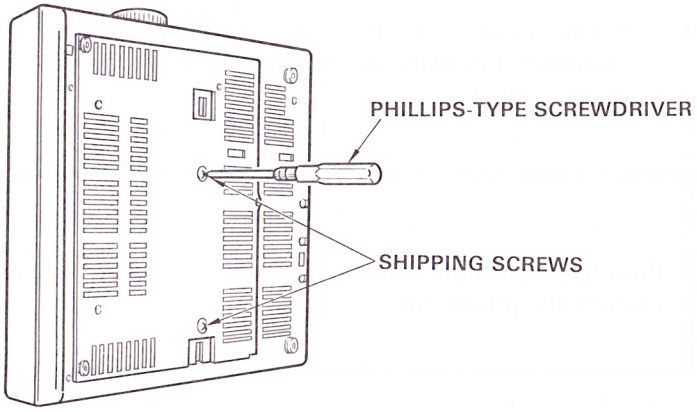


Illustration 3

5. Install the ribbon cartridge, load the paper, and set parameter switches following the instructions in "Using the Model 5 Printer."

6. Use the printer cable to connect the printer to your personal computer, following the instructions in the printer cable installation guide.

> **NOTE:**
>
> Be sure the computer and the printer are turned off before you connect the printer cable.

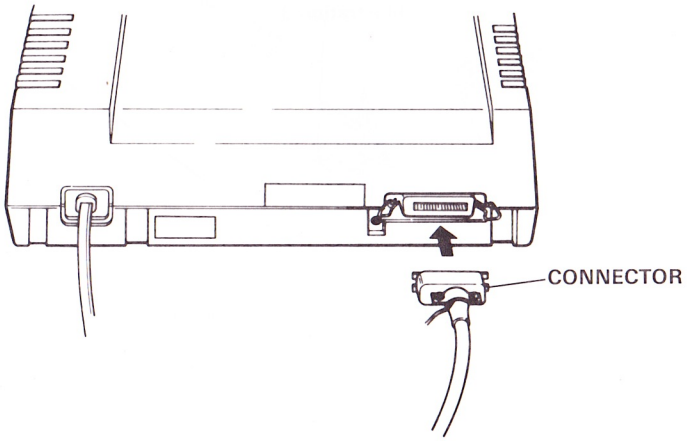


Illustration 4

7. Your Model 5 printer operates on one of the following power sources:

   AC 120V, 50/60Hz
   AC 220V, 50/60Hz
   AC 240V, 50/60Hz

   Be sure your printer is compatible with the power source in your area before you plug it into a power outlet.

8. Refer to "Using the Model 5 Printer" for operating instructions.

7. PERIPHERALS

Specifications

1.	Print method	Impact dot matrix
2.	Print speed	100 characters per second
3.	Print direction	
	Text mode	Bidirectional
	Bit image/ superscript/subscript/ programmed	Unidirectional
4.	Pins in head	9
5.	Line spacing	1/6 in. or programmable
6.	Printing characteristics	
	Matrix	9x9
		6x8 graphic characters
	Character set	96 ASCII
		41 international
		32 control
		37 symbol
		50 graphic
7.	Character size (width x height)	
	Pica-sized/emphasized/ condensed enlarged	2.1 x 3.1 mm
	Pica-sized condensed	1.05 x 3.1 mm
	Pica-sized enlarged/ emphasized enlarged	4.2 x 3.1 mm
	Elite-sized	1.5 x 3.1 mm
	Elite-sized enlarged	3.0 x 3.1 mm
	Superscript/subscript	1.6 mm (height)
8.	Column width (max. characters per line)	
	Pica-sized/emphasized	80
	Enlarged	40
	Condensed	137
	Condensed enlarged	68
	Elite-sized	96
	Elite-sized enlarged	48

9.	Media handling	
	Fanfold paper	101.6 to 245 mm (4 to 10 in.) wide
	Paper feed	Tractor feed
	Copies (original and two carbons)	Up to 0.3 mm (0.012 in.)
	Paper path	Rear
10.	Interface	Centronics*-style (8-bit parallel)
11.	Ink ribbon	
	Color	Black
	Type	Exclusive cartridge
	Life expectancy	3 million characters
12.	Environmental conditions	
	Temperature	5° to 35°C (41° to 95°F)
	Humidity	10% to 80% (no condensation)
13.	Power requirements	
	Voltage	AC 120V ± 10% AC 220/240V ± 10%
	Frequency	49.5 to 60.5 Hz
	Power consumption	70 VA max.
14.	Physical characteristics	
	Height	10.7 cm
	Width (without paper feed knob)	37.2 cm
	Depth	30.3 cm
	Weight	5.1 kg

NOTE:

Specifications are subject to change without notice.

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1. Make sure the system unit is unplugged. Plug the D-shaped end of the cable into the printer controller outlet (or printer/display monitor controller outlet) on the right side of the back of the system unit. Secure the two screws at each end of the plug.

2. Next, plug the other end of the cable into your printer (illustration 2).

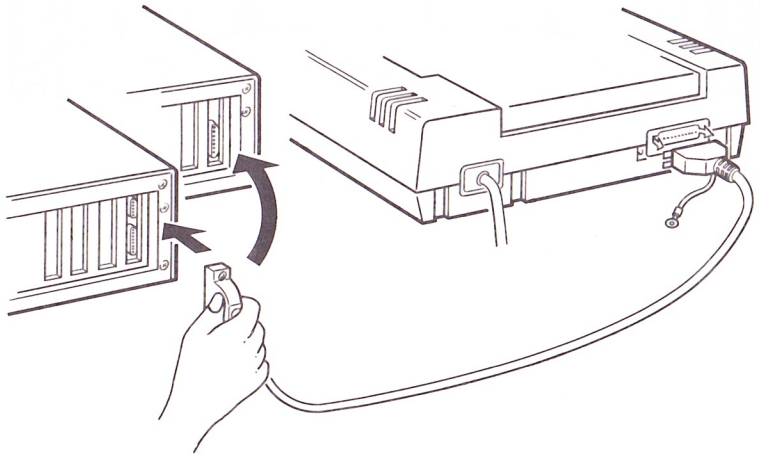

Illustration 2

NOTE:

Attach the ground wire at the printer end of the cable to the metal plate just to the left of the outlet.

Inventory Checklist

The following items should be included in the printer cable package:

- Printer cable
- Installation guide

If any items are missing or damaged, contact the place of purchase.

7. PERIPHERALS

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Installation Guide

Before you install the cable, make sure you have the right printer cable. The cable has a plug on each end; one end has 25 pins inside a D-shaped shield, and the other end has 36 holes (illustration 1).

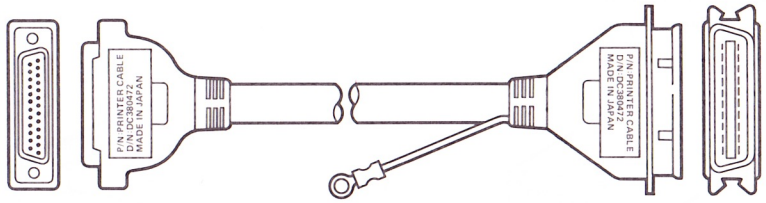

Illustration 1

Inventory Checklist

The following items should be included in the 128K-byte memory expansion board package:

- 128K-byte memory expansion board
- Installation guide

If any items are missing or damaged, contact the place of purchase.

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Installation Guide

If you are installing a display monitor controller board, install it first before proceeding with this section.

1. Make sure the system unit is unplugged. Place the system unit on a table, so that you have access to both sides.

   Using a Phillips-head screwdriver, remove all 5 screws (2 on each side, 1 at center rear) from the system unit (illustration 1).

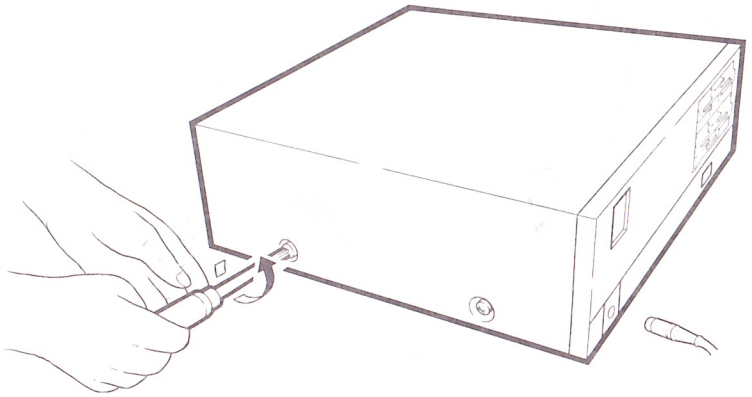


Illustration 1

2. Carefully slide the system unit cover forward from the rear until the cover comes loose from the base—about halfway to the front (illustration 2).

   Tilt and lift the cover from the system unit and set it aside.

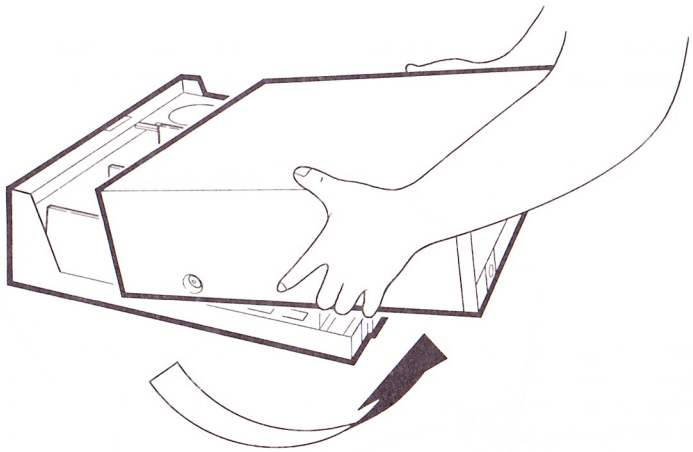


Illustration 2

3. To install the memory board, first remove one of the metal covers at the left rear inside the system unit. (You may use any available slot.)

   Using a Phillips screwdriver, remove the set-screw (illustration 3).

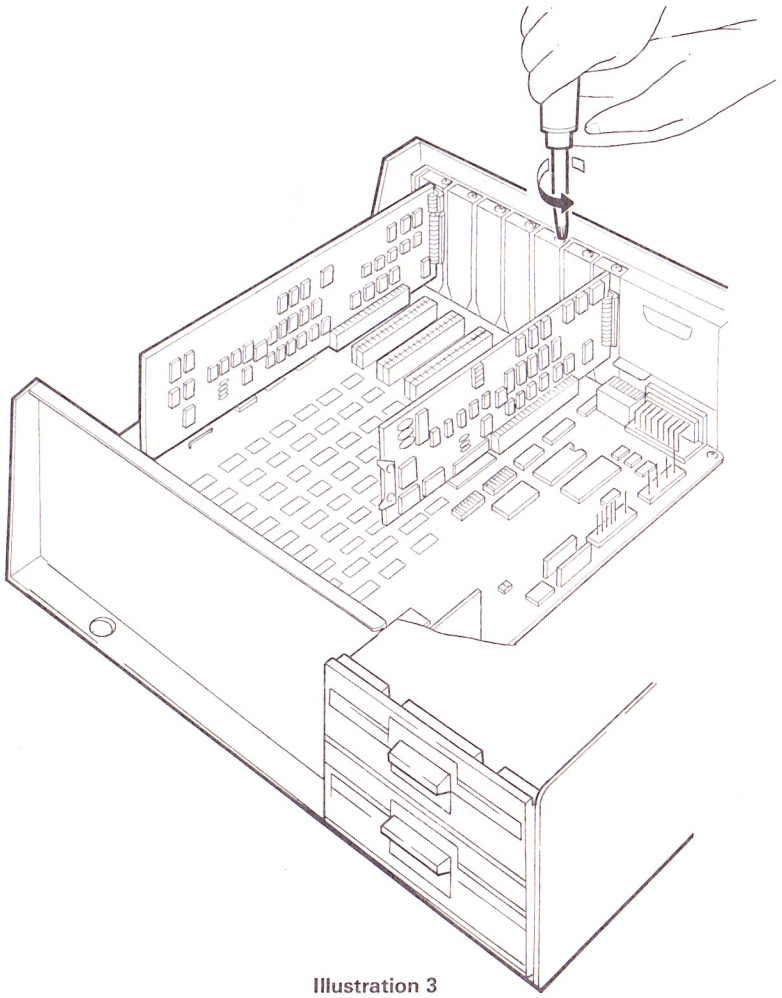


Illustration 3

4. Holding *only* the edges of the plastic controller board (don't touch any of the component parts or wires), carefully push the controller board straight down so that the bottom edge locks firmly into the guide track on the floor of the system unit (illustration 4).

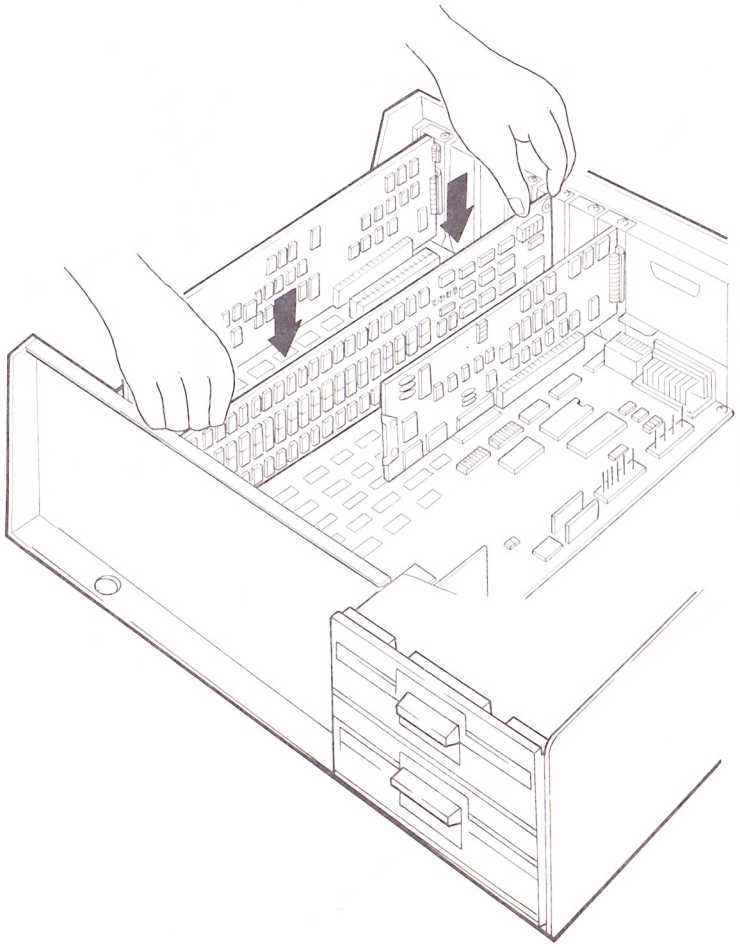


Illustration 4

5. Using the original screw, firmly tighten the new cover plate (with the plug in it) at the rear of the system unit (illustration 5).

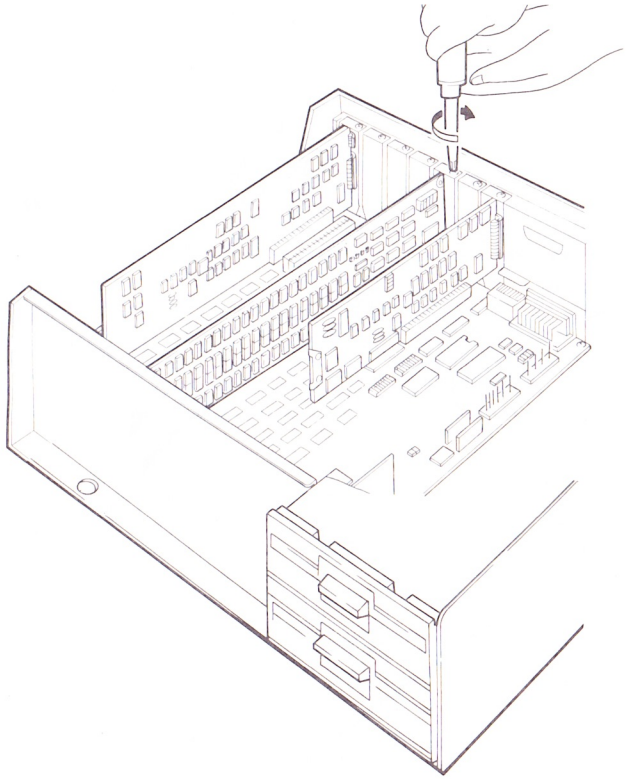


Illustration 5

If you have other controller boards to install, you may want to install them now before replacing the system unit cover. Refer to the specific installation instructions included with the controller boards.

6. Set the switches on the system board as shown in illustrations 6 and 7. Use something with a fairly sharp point (like a ball-point pen or very small screwdriver) to flip the switches.

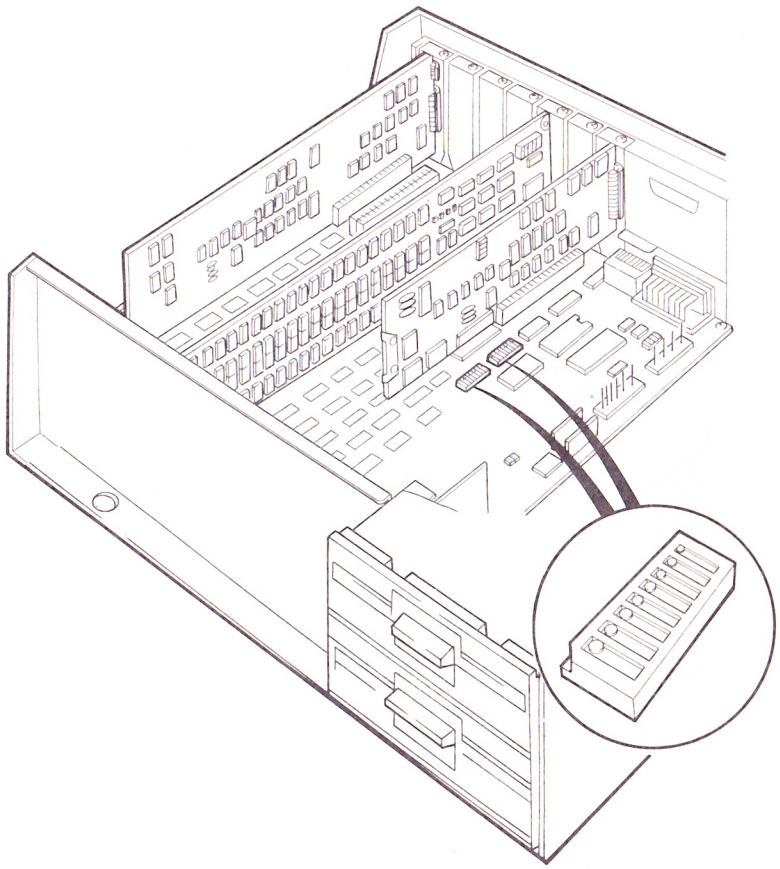


Illustration 6

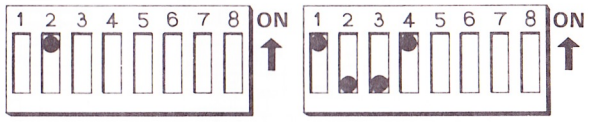
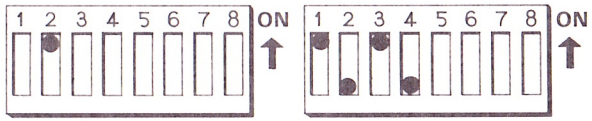
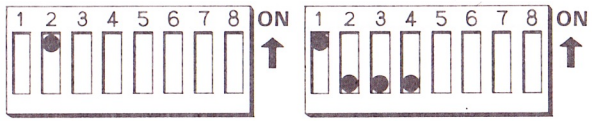
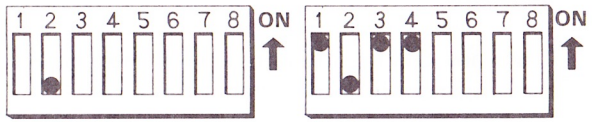
TOTAL MEMORY CAPACITY* (LINEAR MODE)	POSITIONING OF SW1 AND SW2
	SW1 / SW2
256KB	
384KB	
512KB	
640KB	

Illustration 7

*Includes 128K bytes of RAM on the system board.

7. Set the switches on the add-on memory board as shown in illustration 8.

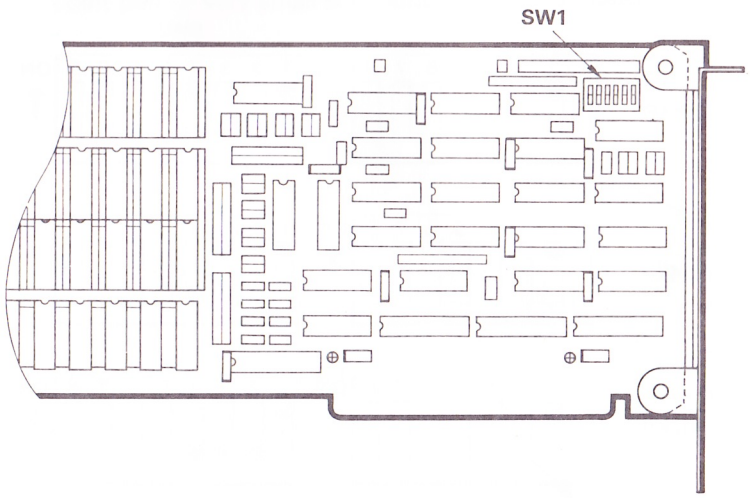


Illustration 8

Switches SW1-1 through SW1-4 are set according to the total memory in your system.

SW1-1	SW1-2	SW1-3	SW1-4	Memory Capacity
ON	OFF	OFF	OFF	128KB
ON	ON	OFF	OFF	256KB
ON	ON	ON	OFF	384KB
ON	ON	ON	ON	512KB

Switch SW1-5 sets an addressing mode, as shown in the following table (the linear address mode is the normal setting):

SW1-5	Mode
ON	Block address mode
OFF	Linear address mode

Switch SW1-6 should be off.

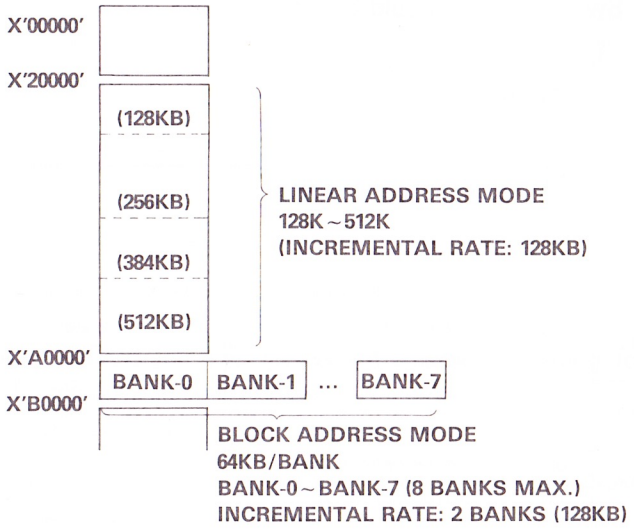
Switch Setting

SW1-1~4 \ SW1-5		SW1-5=OFF : Linear Address Mode (Normal Setting)	SW1-5=ON : Block Address Mode
SW1-1	OFF	20000H~3FFFFH Invalid	BANK 0, 1 Invalid
	ON	20000H~3FFFFH Valid	BANK 0, 1 Valid: (S2=0, S1=0)
SW1-2	OFF	40000H~5FFFFH Invalid	BANK 2, 3 Invalid
	ON	40000H~5FFFFH Valid	BANK 2, 3 Valid: (S2=0, S1=1)
SW1-3	OFF	60000H~7FFFFH Invalid	BANK 4, 5 Invalid
	ON	60000H~7FFFFH Valid	BANK 4, 5 Valid: (S2=1, S1=0)
SW1-4	OFF	80000H~9FFFFH Invalid	BANK 6, 7 Invalid
	ON	80000H~9FFFFH Valid	BANK 6, 7 Valid: (S2=1, S1=1)

Block Specifying Register

- Valid only when SW1-5 = ON (block address mode)
- Bank specifying parameters are written into the X'FFD00' address using a memory WRITE instruction.

Memory Map



8. Replace the system unit cover by carefully placing the cover over the unit and sliding it toward the rear of the system unit (illustration 9).

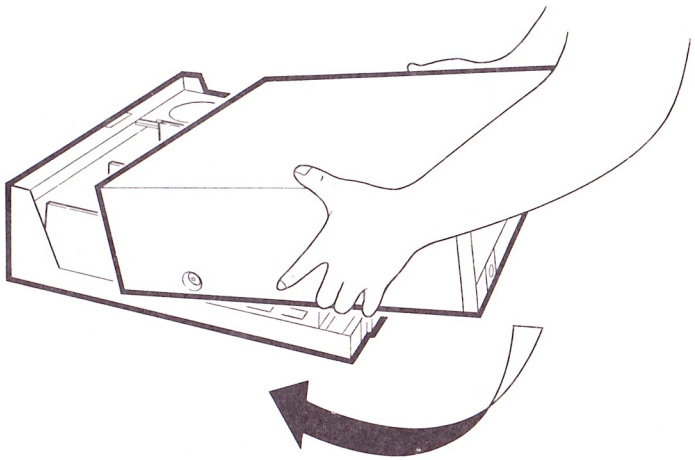


Illustration 9

9. When the cover is back in position, firmly tighten the original 5 screws (2 on each side, 1 at center rear) (illustration 10).

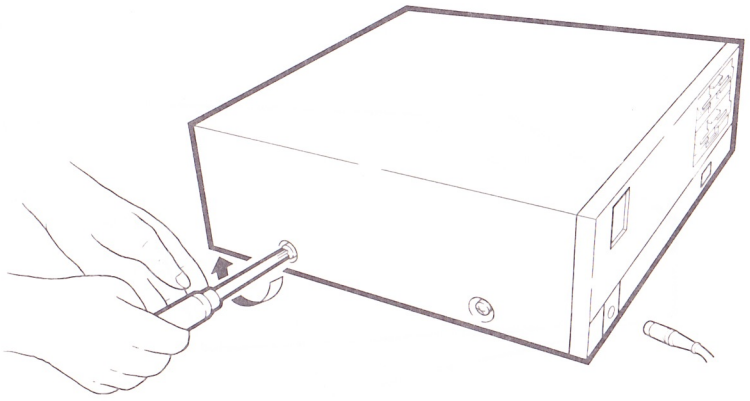


Illustration 10

10. Reconnect all the cables (illustration 11).

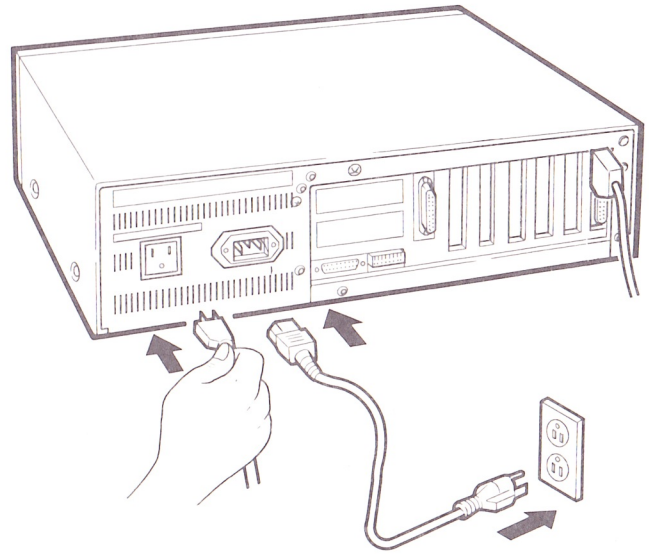


Illustration 11

Your SPERRY Personal Computer is equipped with a UL-approved and CSA-certified 3-prong plug. To avoid electrical shock hazards, make sure that it is only plugged into a properly grounded 3-hole receptacle.

NOTE:

Only the monochrome display monitor should be plugged into the system unit. If you are using a color display monitor, it should be connected to a separate electrical outlet not located on the system unit.

Inventory Checklist

The following items should be included in the 256KB Memory Expansion III Board package:

- 256KB Memory Expansion III Board
- Two mounting screws
- Installation guide

If any items are missing or damaged, contact the place of purchase.

NOTE:

The Memory Expansion III Board is only used on PC systems that have six expansion slots on the system board.

After installing the Memory Expansion III Board, insert this booklet in Chapter 7 in the Operating Guide.

SPERRY

Personal Computer System
Memory Expansion Board
UP-11356 Update A

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Installation Guide

If you are installing a display monitor controller board, install it first before proceeding with this section.

1. Make sure the system unit is unplugged. Place the system unit on a table, so that you have access to both sides.

   Using a Phillips-head screwdriver, remove all five screws (two on each side, one at center rear) from the system unit (illustration 1).

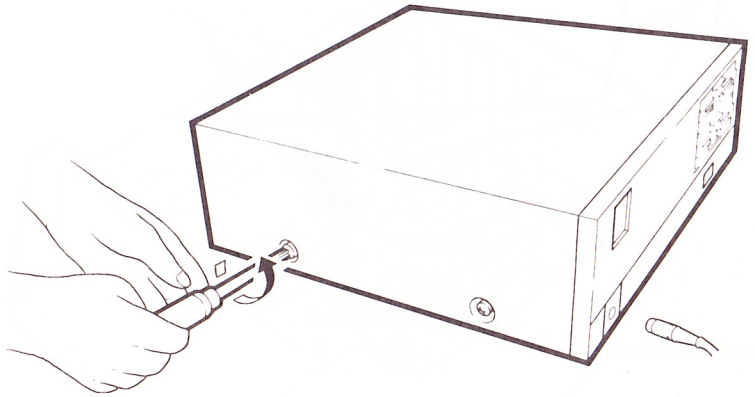


Illustration 1

2. Carefully slide the system unit cover forward from the rear until the cover comes loose from the base—about halfway to the front (illustration 2).

   Tilt and lift the cover from the system unit and set it aside.

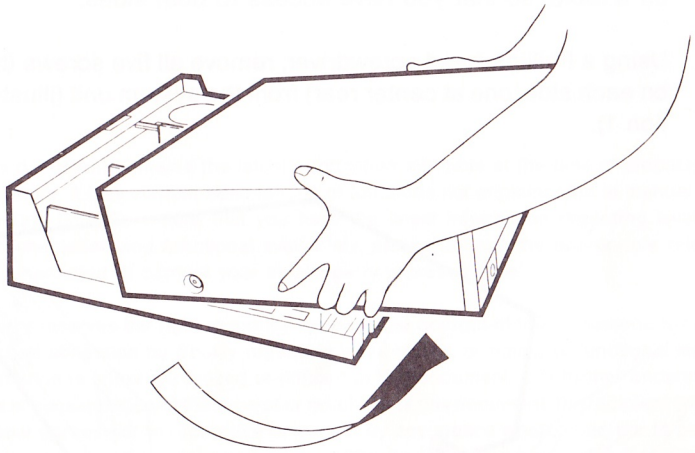


Illustration 2

3. Holding only the edges of the Memory Expansion III Board (don't touch any of the component parts or wires), carefully push the memory board straight down so that all 30 pins on the memory board are connected to the female connector on the system board. Ensure that the holes in the base of the Memory Expansion III Board are aligned with the support pins on the system board. Then, using a Phillips-head screwdriver, screw the mounting screws into the support pins.

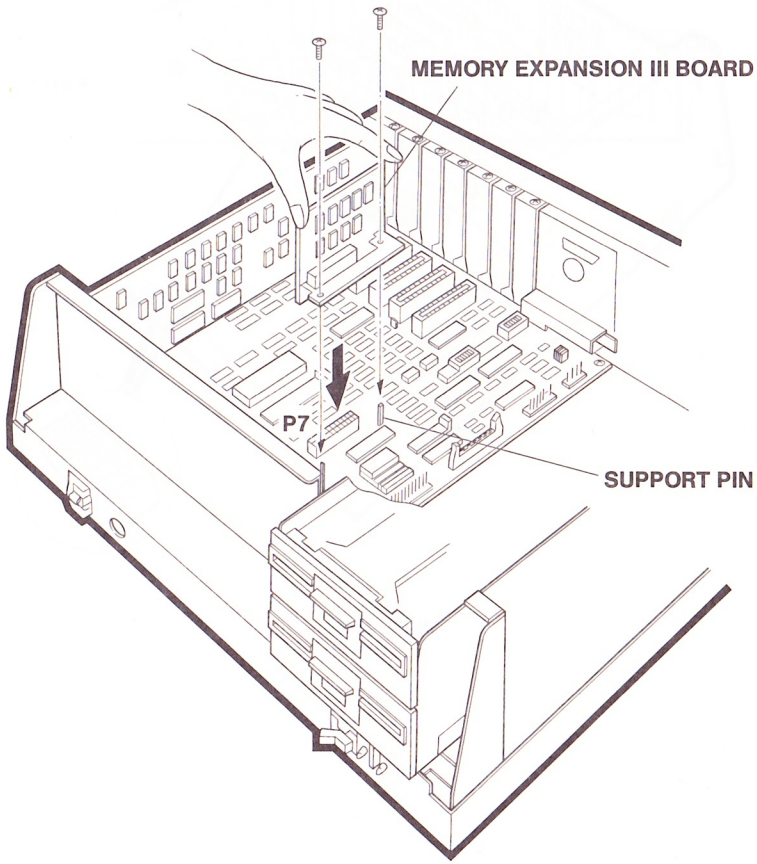


Illustration 3

4. Set the switches on the system board as shown in illustrations 4 and 5. Use something with a fairly sharp point (like a ballpoint pen or very small screwdriver) to flip the switches.

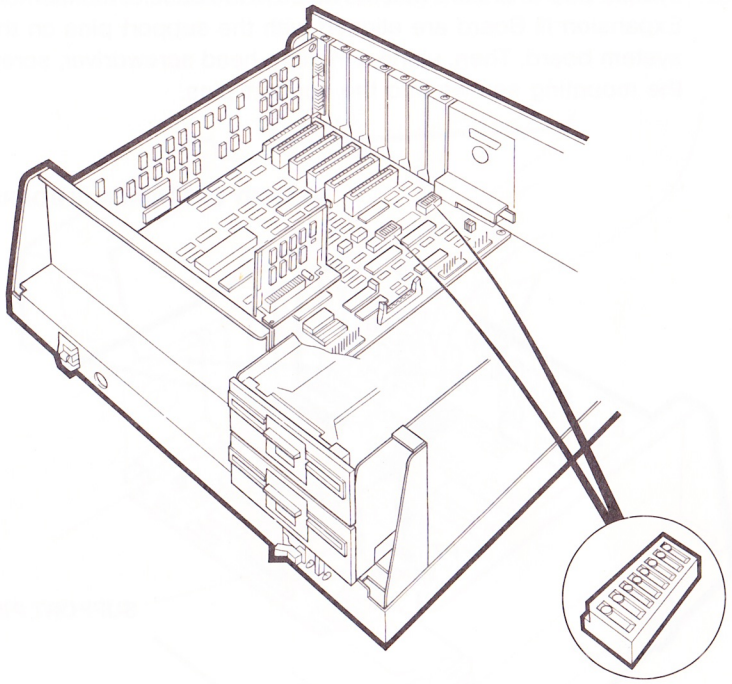


Illustration 4

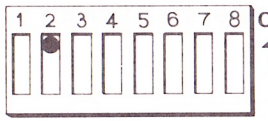
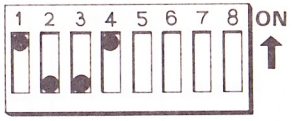
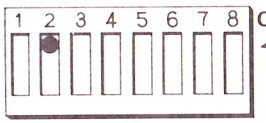
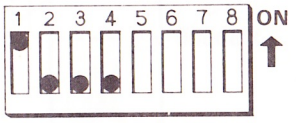
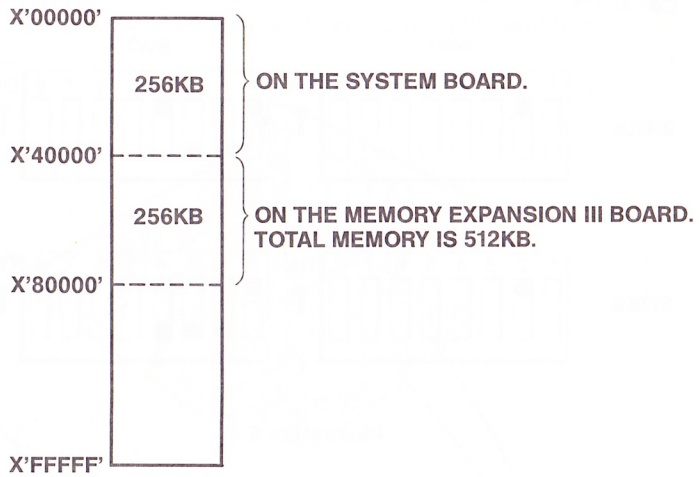
TOTAL MEMORY CAPACITY*	POSITIONING OF SW1 AND SW2	
	SW1	SW2
256KB		
512KB		

Illustration 5

* Includes 256KB of RAM on the system board.

MEMORY MAP



5. Replace the system unit cover by carefully placing the cover over the unit and sliding it toward the rear of the system unit (illustration 6).

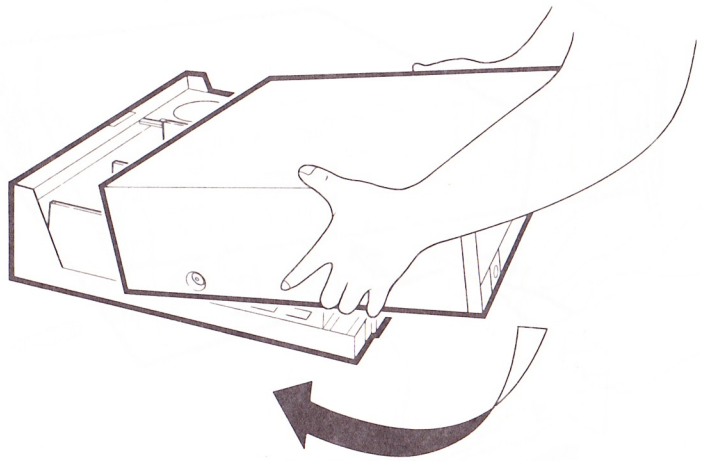


Illustration 6

6. When the cover is back in position, firmly tighten the original five screws (two on each side, one at center rear) (illustration 7).

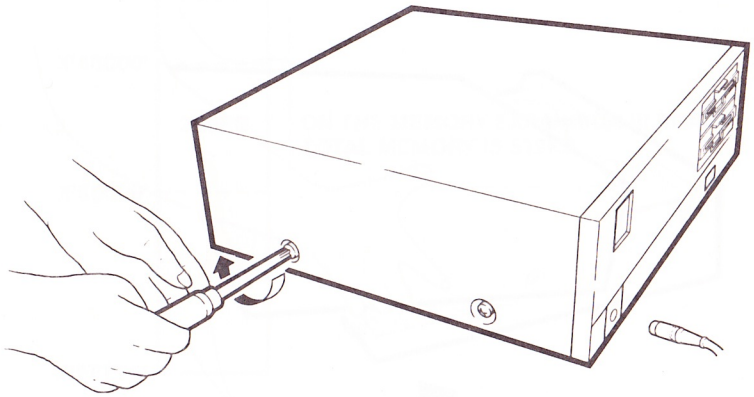


Illustration 7

7. Reconnect all the cables (illustration 8).

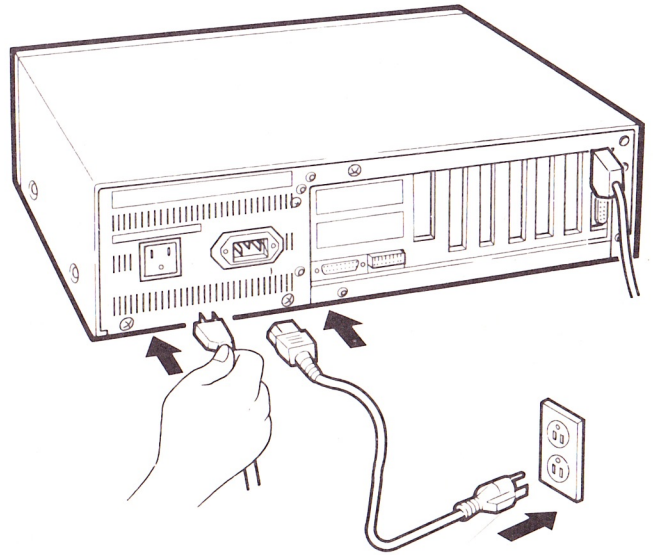


Illustration 8

Your SPERRY Personal Computer is equipped with a UL-approved, CSA-certified, 3-prong plug. To avoid electrical shock, make sure that it is only plugged into a properly grounded 3-hole receptacle.

NOTE:

Only the monochrome display monitor should be plugged into the system unit. If you are using a color display monitor, it should be connected to a separate electrical outlet.

Inventory Checklist

- 10 memory chips (F-4655)
  or
  18 memory chips (F-4216)

- Installation Guide

If any of these items are missing or damaged, contact the place of purchase immediately.

SPERRY

Personal Computer System
Memory Chip Kit
UP-11361

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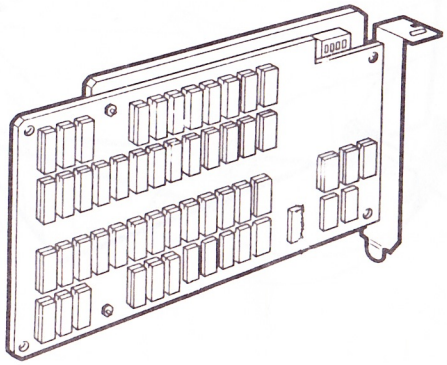
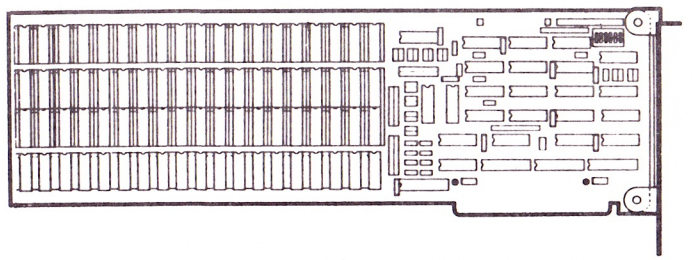
Important Note

This memory chip kit may include either 10 or 18 memory chips, depending on which kit you ordered. Make sure that you have the proper number of chips before beginning.

If you have the dual-card Memory Expansion I/II Board (shown below), you need only 10 chips for the first 128K bytes of memory you wish to add to the board. Each additional 128K bytes, however, requires 18 memory chips.



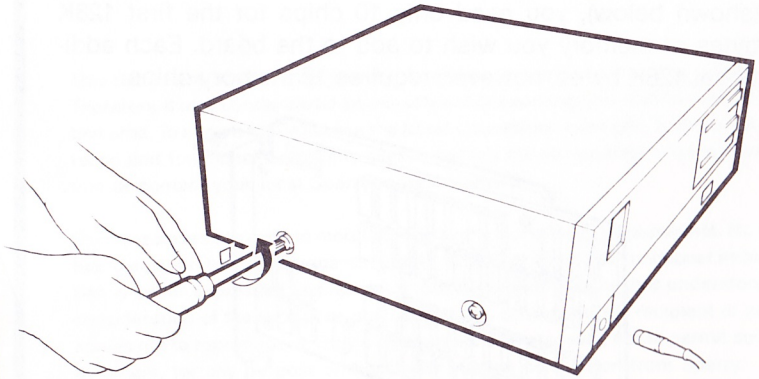
If you have the single-card memory expansion board (shown below), you will need 18 memory chips for each 128K bytes of memory you wish to add to the board.



Removing the Memory Expansion Board

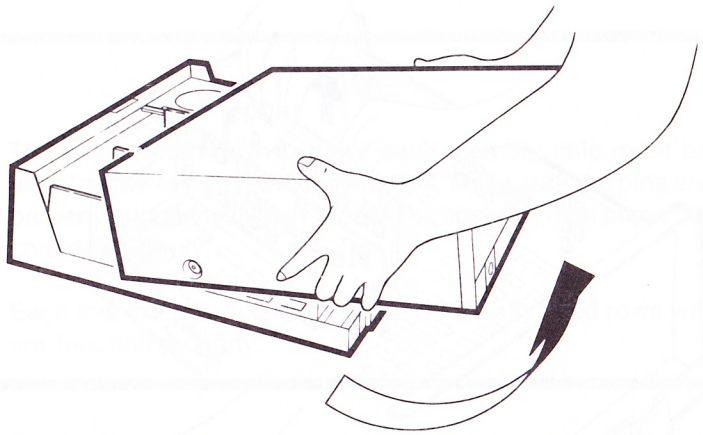
1. Make sure the system unit is unplugged. Place the system unit on a table, so that you have easy access to all sides.

   Using a Phillips-head screwdriver, remove all 5 screws (2 on each side, 1 at center rear) from the system unit.

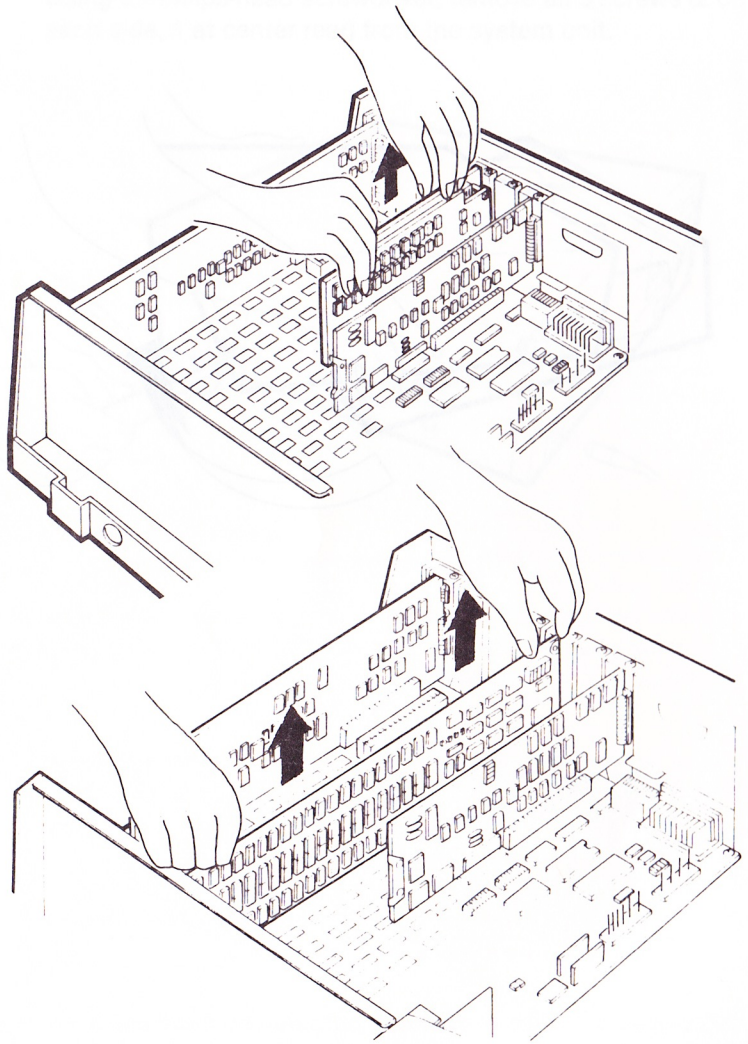


2. Carefully slide the system unit cover forward from the rear until the cover comes loose from the base–about halfway to the front.

   Tilt and lift the cover from the system unit and set it aside.



3. Remove the memory expansion board from your PC (if it is already installed) by removing the set screw which secures the board, then lift the board straight up and out of the system unit. Be careful to handle the memory board only by its edges.



Adding Chips to the Single-Card Memory Expansion Board

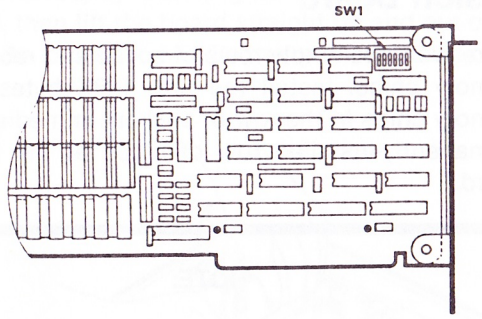
1. There are three empty rows of sockets to receive additional memory chips. Install the first 128K bytes (18 chips) of memory chips in the row of sockets immediately above the permanently-installed row of chips at the bottom of the board.

NOTE:

The small notch at the end of each memory chip must be oriented toward the **TOP** of the board. Make sure the pins are properly aligned with the holes in the sockets, then press the chip down firmly.

Each row must be filled completely. Partially-filled rows will not function properly.

2. Set the switches on the memory expansion board as shown below.



Switches SW1-1 through SW1-4 are set according to the amount of memory on your memory expansion board. This does not include the memory on the system board.

SW1-1	SW1-2	SW1-3	SW1-4	Memory Capacity
ON	OFF	OFF	OFF	128KB
ON	ON	OFF	OFF	256KB
ON	ON	ON	OFF	384KB
ON	ON	ON	ON	512KB

Switch SW-5 sets an addressing mode, as shown below. This switch is normally left in the OFF position.

SW1-5	Mode
ON	Block address mode
OFF	Linear address mode

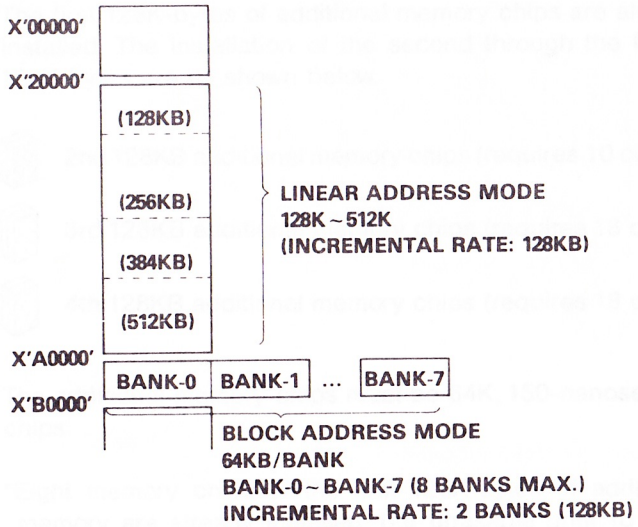
Switch SW-6 can be set to either position.

3. If you are using Block Address Mode (SW1-5 = ON), the following information will pertain to you.

SW1-1~4 \ SW1-5		SW1-5=OFF : Linear Address Mode (Normal Setting)	SW1-5=ON : Block Address Mode
SW1-1	OFF	20000H~3FFFFH Invalid	BANK 0, 1 Invalid
	ON	20000H~3FFFFH Valid	BANK 0, 1 Valid: (S2=0, S1=0)
SW1-2	OFF	40000H~5FFFFH Invalid	BANK 2, 3 Invalid
	ON	40000H~5FFFFH Valid	BANK 2, 3 Valid: (S2=0, S1=1)
SW1-3	OFF	60000H~7FFFFH Invalid	BANK 4, 5 Invalid
	ON	60000H~7FFFFH Valid	BANK 4, 5 Valid: (S2=1, S1=0)
SW1-4	OFF	80000H~9FFFFH Invalid	BANK 6, 7 Invalid
	ON	80000H~9FFFFH Valid	BANK 6, 7 Valid: (S2=1, S1=1)

Bank specifying parameters are written into the X'FFDOO' address using a memory WRITE instruction.

Memory Map



4. Proceed to the section 'Installing the Memory Expansion Board', page 15 of this guide for instructions on setting switches on the system board and installing your memory expansion board.

Adding Chips to the Memory Expansion I/II Board

1. To increase the amount of additional memory, install the new memory chips according to the illustration below.

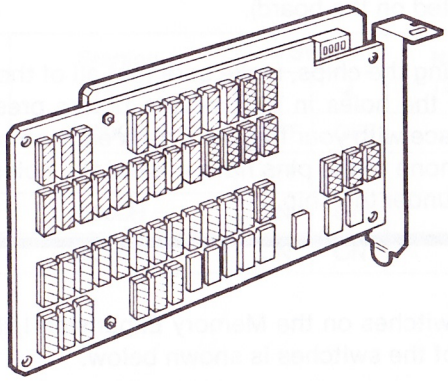


Illustration 9

The first 128K-bytes of additional memory chips are already installed. The installation of the second through the fourth 128K-bytes are as shown below.

2nd 128KB additional memory chips (requires 10 chips)*

3rd 128KB additional memory chips (requires 18 chips)

4th 128KB additional memory chips (requires 18 chips)

The additional memory chips must be 64K, 150-nanosecond chips.

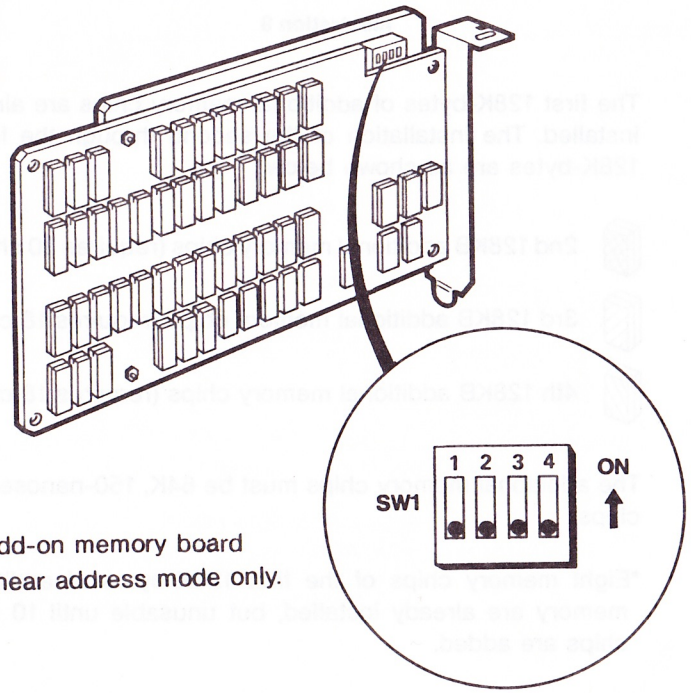
*Eight memory chips of the first 128K-bytes of additional memory are already installed, but unusable until 10 more chips are added.

NOTE:

Make sure that the notch on each memory chip is facing the **BOTTOM** of the Memory Expansion I/II Board (the same direction as the notch on the other chips which are permanently mounted on the board).

When installing the chips, make sure that all of the pins are aligned with the holes in the sockets before pressing the chips into place with your fingers. Check each chip to make certain that none of the pins have missed the holes or have been folded under the chip.

2. Set the switches on the Memory Expansion I/II Board. The location of the switches is shown below.



The add-on memory board has linear address mode only.

3. Switches SW-1 and SW-2 designate the starting segment of the memory on the Memory Expansion I/II Board. Switches SW1-3 and SW1-4 designate the number of 128K-byte blocks which are installed on the Memory Expansion I/II Board.

Switch Settings

SW1		Starting segment	SW1		Number of 128KB blocks
1	2		3	4	
OFF	OFF	2000H ~	OFF	OFF	1 128KB
OFF	ON	4000H ~	OFF	ON	2 256KB
ON	OFF	6000H ~	ON	OFF	3 384KB
ON	ON	8000H ~	ON	ON	4 512KB

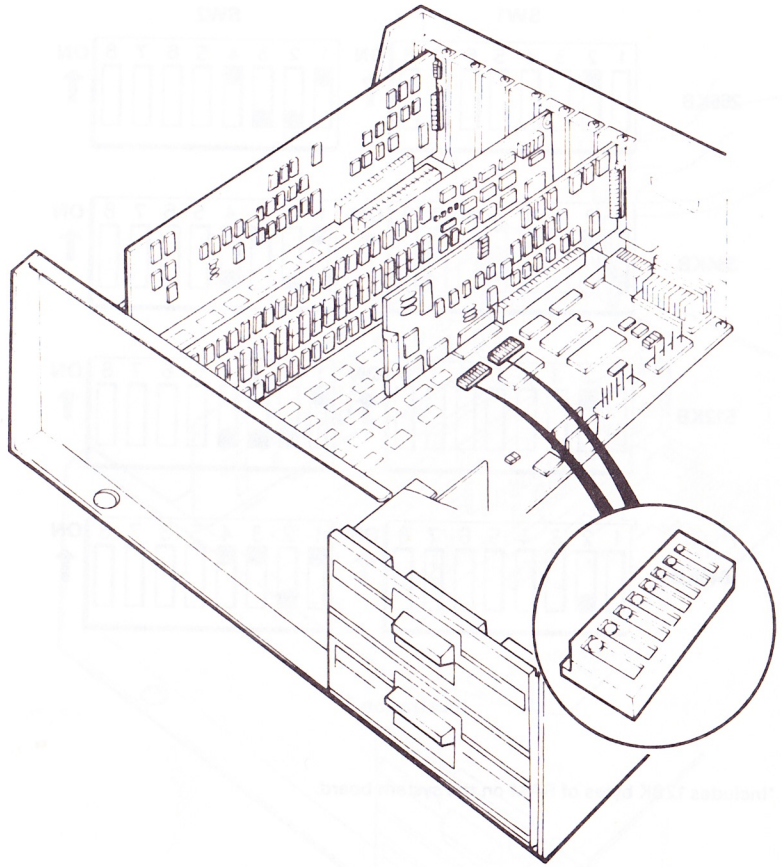
Example:

To install the Memory Expansion I/II Board in a SPERRY PC with 128K bytes of RAM memory on the system board, set SW1-1 and SW1-2 to OFF. This sets up the starting segment as 2000H.

4. Proceed to the section 'Installing the Memory Expansion Board', page 15 of this guide for instructions on setting the switches on the system board and for installing the memory board in the system unit.

Installing the Memory Expansion Board

1. Set the switches on the system board as shown in the following two illustrations. Use something like a ball- point pen or a small screwdriver to flip the switches.



System Board Switch Settings

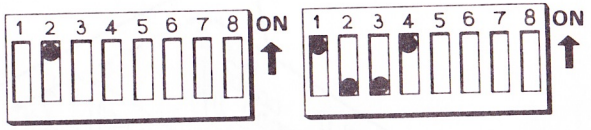
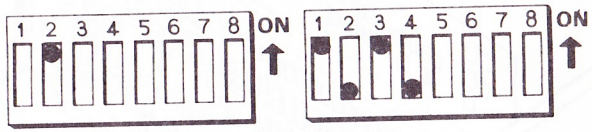
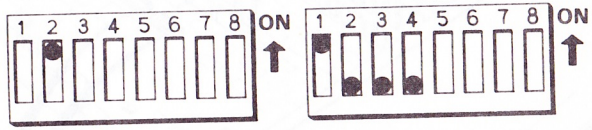
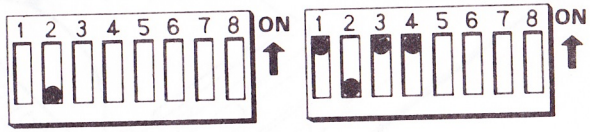
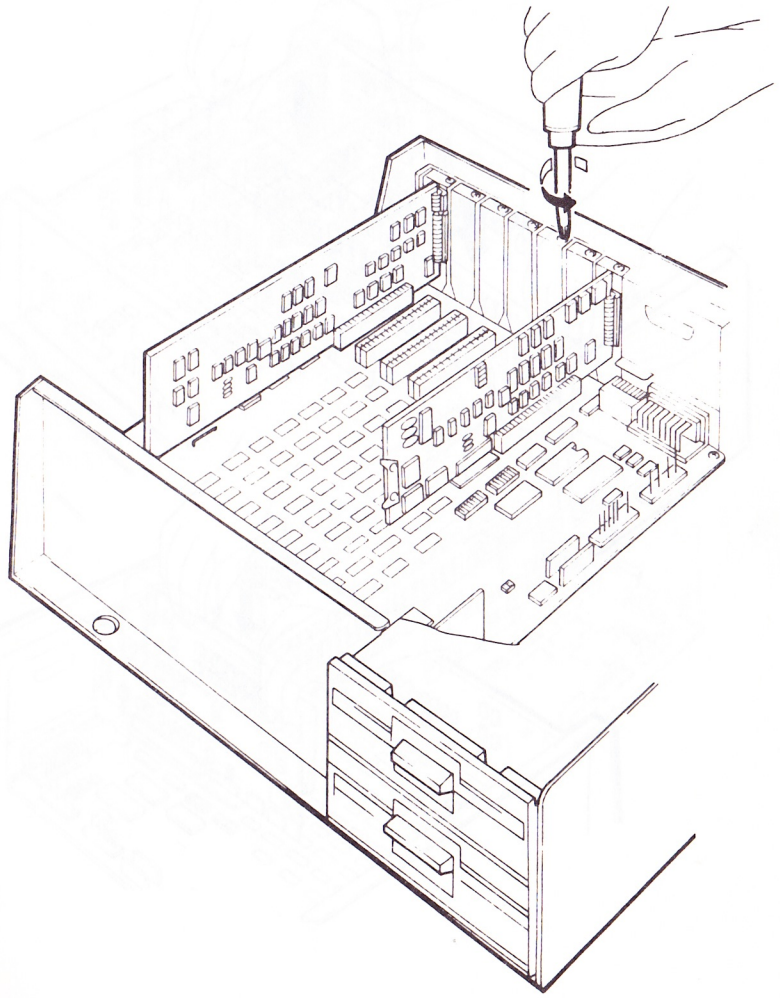
TOTAL MEMORY CAPACITY* (LINEAR MODE)	POSITIONING OF SW1 AND SW2	
	SW1	SW2
256KB		
384KB		
512KB		
640KB		

Illustration 7

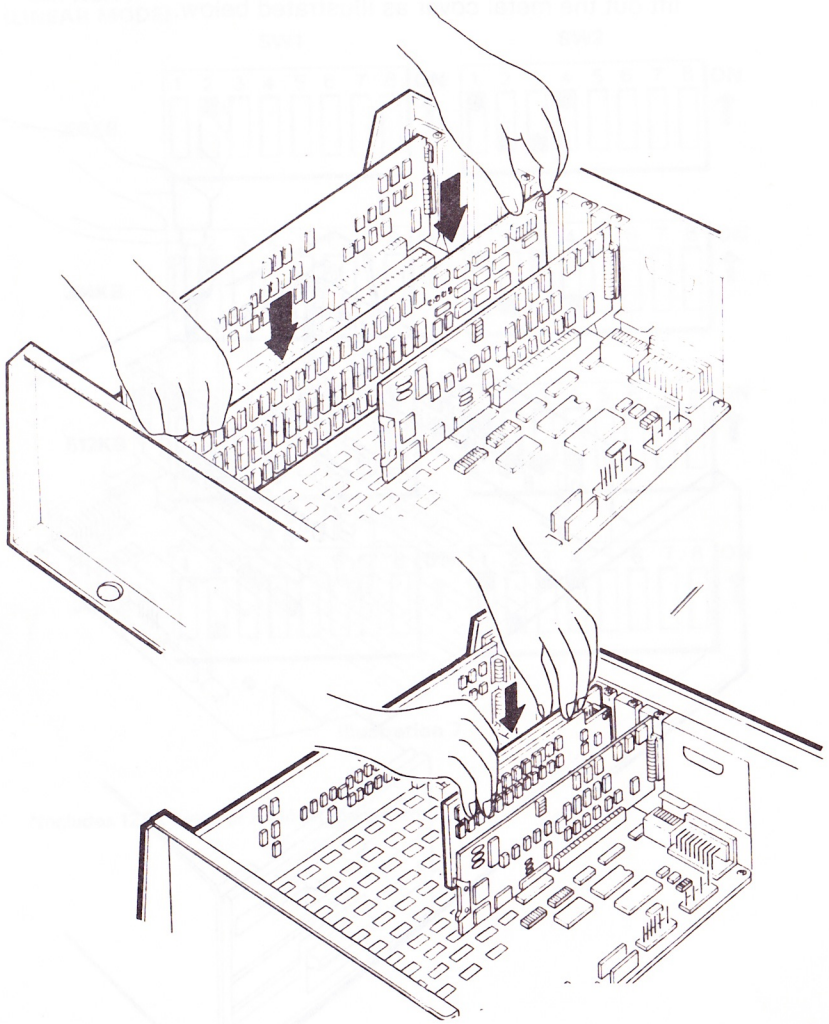
*Includes 128K bytes of RAM on the system board.

2. To install your memory expansion board, first remove one of the metal covers at the left rear of the system unit (if you haven't already done so).

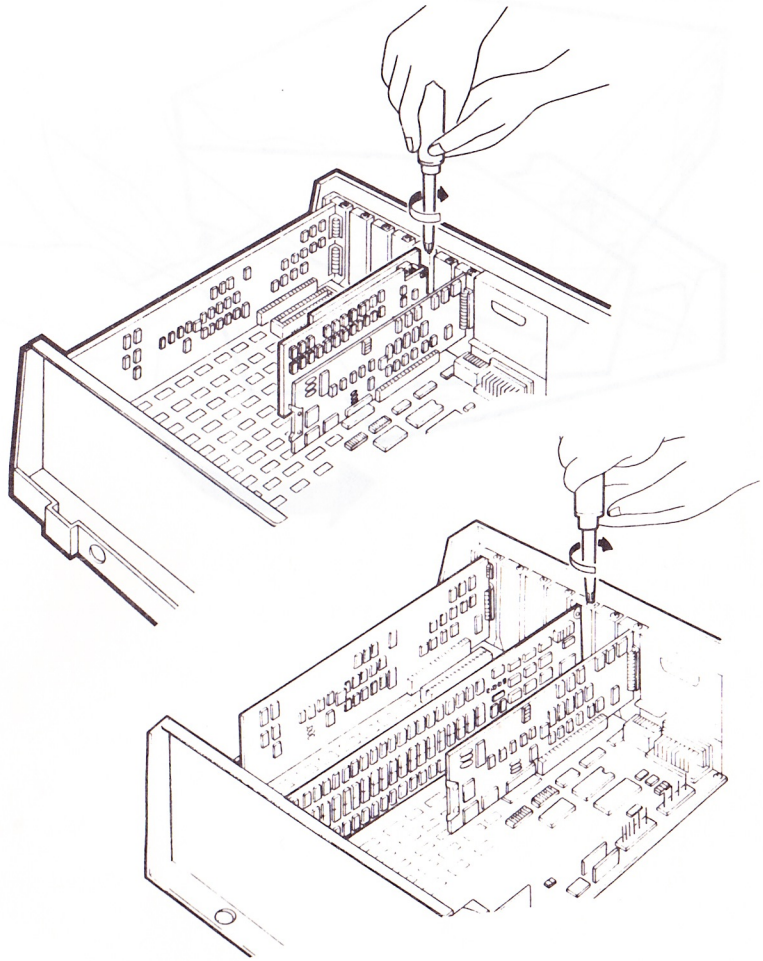
   Using a Phillips-head screwdriver, remove the set screw and lift out the metal cover as illustrated below.



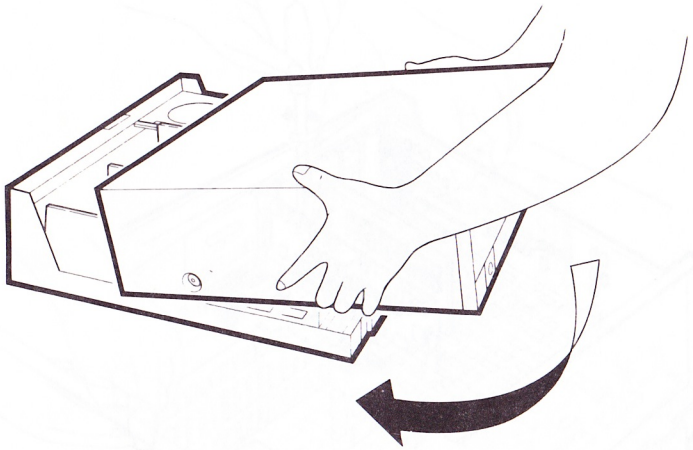
3. Holding the edges of the memory expansion board (don't touch any of the components), carefully push the board straight down so that the bottom edge locks firmly into the connector on the system board.



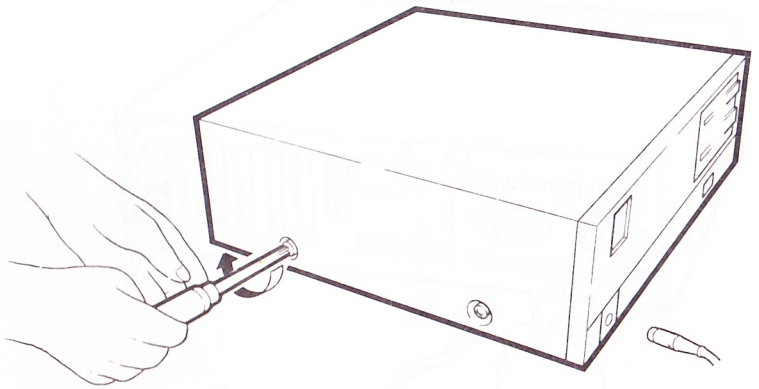
4. Replace and tighten the set screw which secures the board to the rear of the system unit.



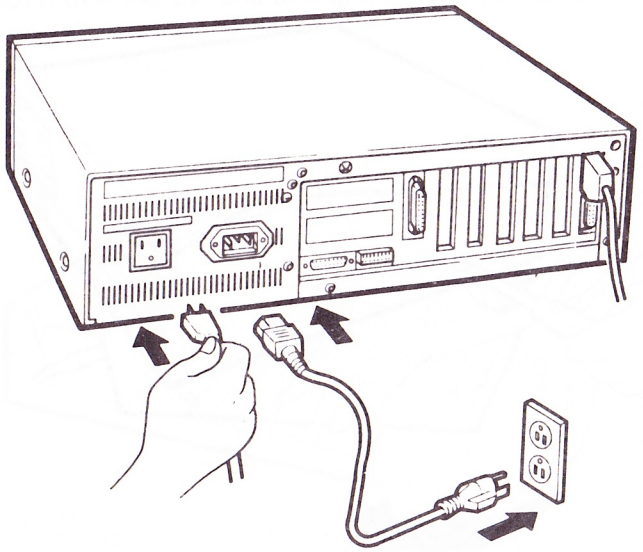
5. Double check the installation, including the switch settings, then replace the system unit cover by carefully placing the cover over the unit and sliding it toward the rear of the system unit.



6. Replace and tighten the system unit cover screws.



7. Reconnect the cables to the system unit.



Your SPERRY PC is equipped with a UL-approved, CSA-certified, 3- prong plug. To avoid electrical shock, make sure that it is only plugged into a properly-grounded three-hole receptacle.

The installation is now complete. If you experience problems, double-check your entire installation, including switch settings and the memory chips you have inserted.

NOTES:

Your SPERRY Personal Computer is equipped with a UL-approved, CSA-certified, 3-pronged plug. To avoid electrical shock, make sure that it is only plugged into a properly grounded 3-hole receptacle.

The diagnostic diskette (DIAGX 2.11) includes a function that prepares the fixed disk to be moved by positioning the read/write heads to a safe area. Use this function before moving a fixed disk system.

Refer to Chapter 6 of the Operating Guide for details.

Inventory Checklist

The following items should be included in the fixed disk drive and controller package:

- Fixed disk drive controller
- Two signal cables
- Fixed disk drive
- Installation guide

If any items are missing or damaged, contact the place of purchase.

NOTES:

If you purchased a fixed disk drive system, the fixed disk drive, controller, and signal cables should already be installed in the system unit. This guide will help in the event that you need to remove or replace the fixed disk drive, controller, or cables.

If you purchased a diskette drive system, install the fixed disk drive components according to the instructions in this installation guide.

Insert this booklet in the "System Unit" section of Chapter 7 in the Operating Guide.

7. OPTIONS

SPERRY

Personal Computer System
Fixed Disk Drive
UP-10522 Update B

This document contains the latest information available at the time of preparation. Therefore, it may contain descriptions of functions not implemented at manual distribution time. To ensure that you have the latest information regarding levels of implementation and functional availability, please consult the appropriate release documentation or contact your local Sperry representative.

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Installation Guide

Before you begin, load the DOS system and check the DOS version by entering the command VER. The version number that appears must be at least 2.11 to work with a fixed disk.

Then check the ROM version with the command ROMVER. You can load from the fixed disk only if your ROM version is at least 2.0.

1. Make sure the system unit is unplugged. Place the system unit on a table, so that you have access to both sides.

   Using a Phillips-head screwdriver, remove all five screws (two on each side, one at center rear) from the system unit (illustration 1).

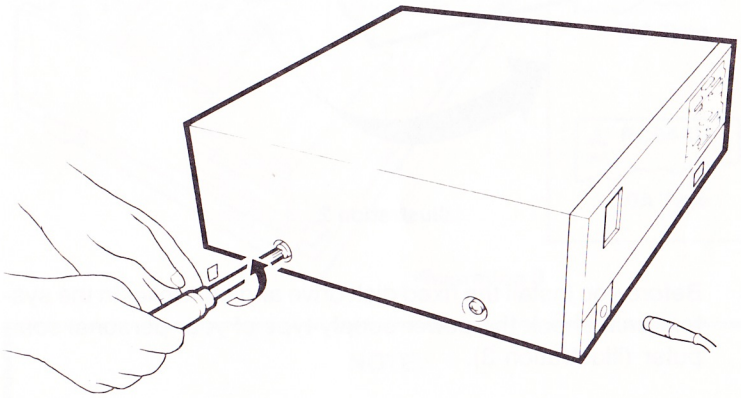


Illustration 1

2. Carefully slide the system unit cover forward from the rear until the cover comes loose from the base – about halfway to the front (illustration 2).

   Tilt and lift the cover from the system unit and set it aside.

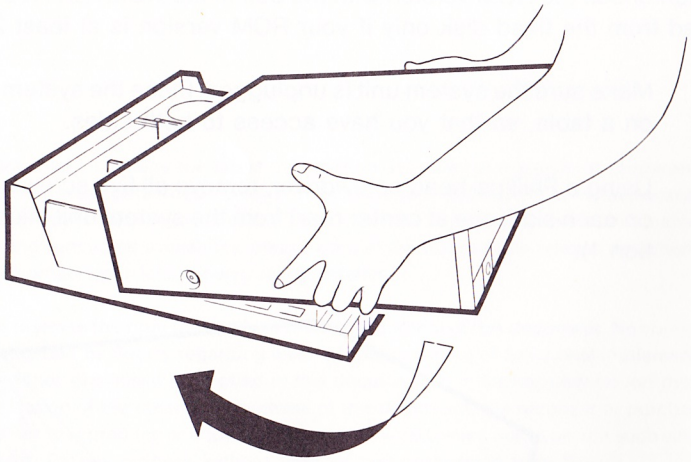


Illustration 2

3. Before you install the fixed disk drive and controller in the system unit, check the power supply type of your personal computer (illustration 3).

If your PC has the 13A type power supply (*not* labeled PC04–UA), continue with installation.

If your PC has the 10A type power supply (labeled PC04–UA), you must install the 13A type power supply before proceeding with installation. Refer to the power supply installation guide included in the power supply upgrade kit.

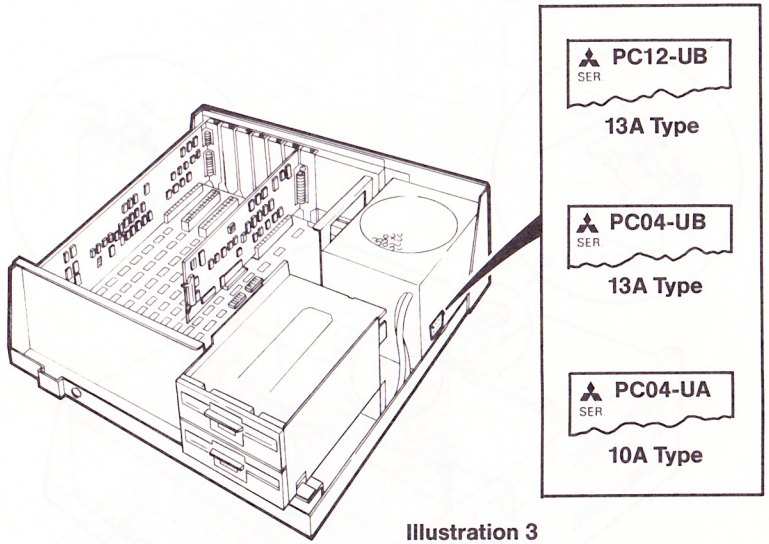


Illustration 3

NOTE:

Some systems have seven expansion slots on the system board, including a slot for the diskette controller board. Other systems place the diskette controller logic components on the system board and eliminate the seventh slot. This Installation Guide illustrates a system containing seven expansion slots with the diskette controller board in the seventh slot. The board described in this Installation Guide may be used with either system.

NOTE:

To install only the fixed disk drive controller, go to step 13.

4. To install the fixed disk drive, first disconnect the power cable and signal cable from the diskette drives (illustration 4).

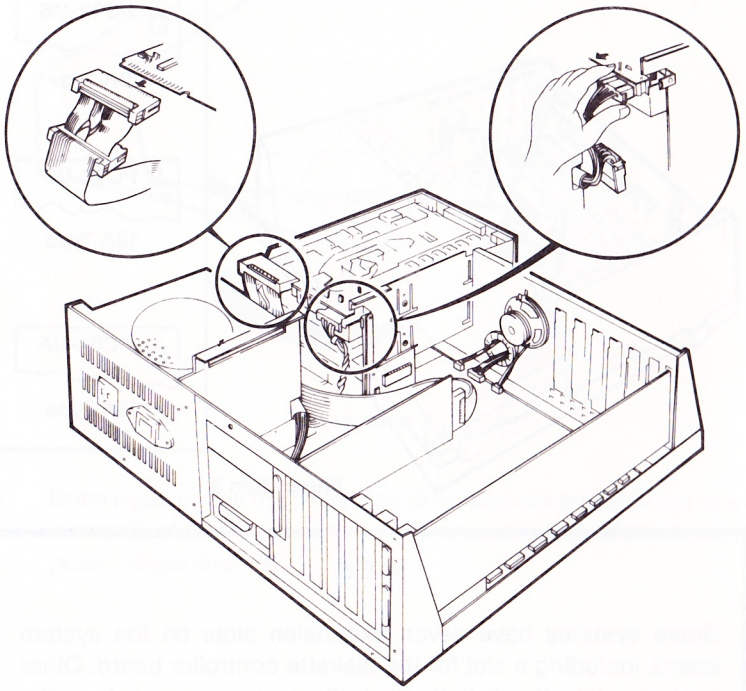
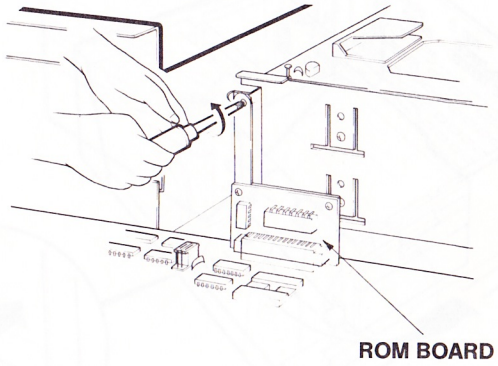


Illustration 4

5. If your computer has a ROM board on the system board, remove the mounting screw as shown in illustration 5.

6. Remove the two chassis mounting screws (illustration 6).



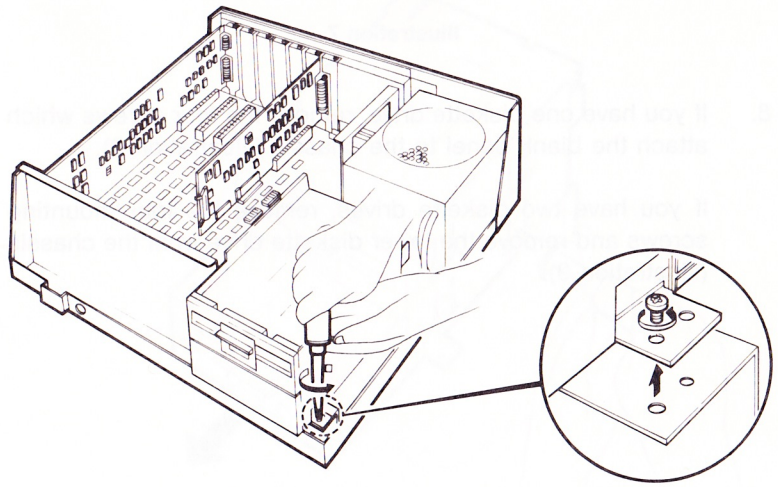


Illustration 6

7. Remove the diskette drive chassis from the system unit (illustration 7).

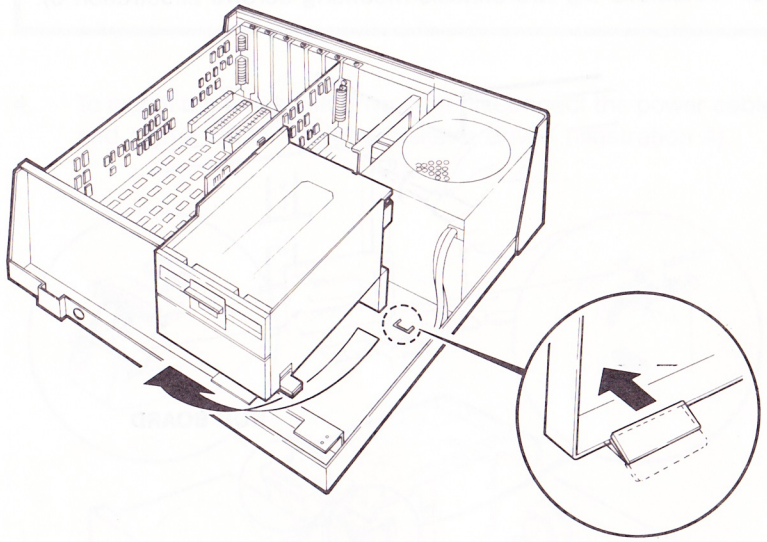


Illustration 7

8. If you have one diskette drive, remove the four screws which attach the blank panel to the chassis (illustration 8).

   If you have two diskette drives, remove the four mounting screws and remove the lower diskette drive from the chassis (illustration 9).

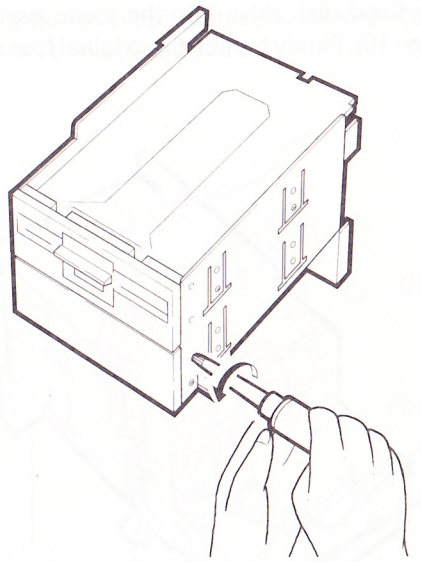


Illustration 8

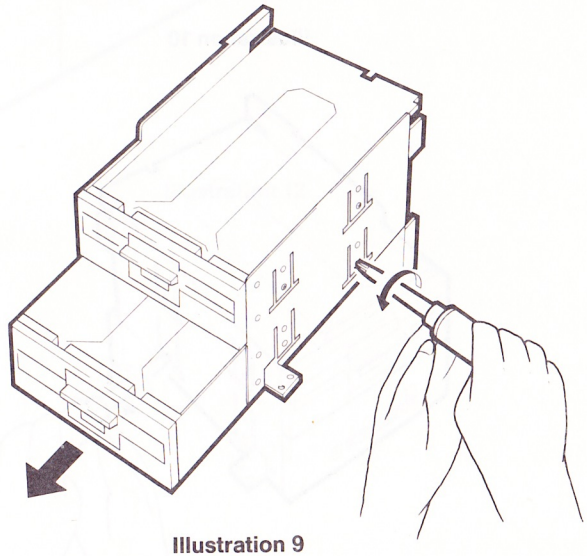


Illustration 9

9. Slide the fixed disk drive into the lower part of the chassis (illustration 10). Firmly tighten the original four screws (illustration 11).

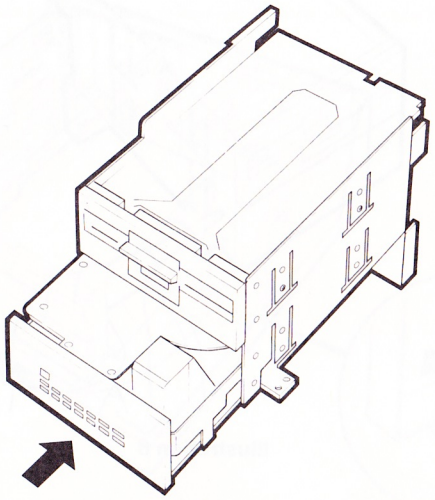


Illustration 10

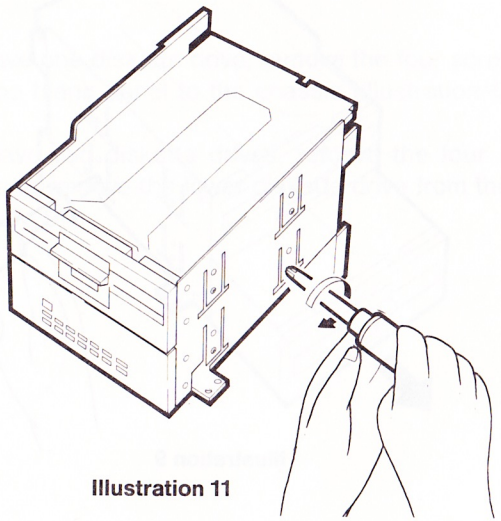


Illustration 11

10. Connect the power supply cables to the diskette drive and the fixed disk drive (illustration 12).

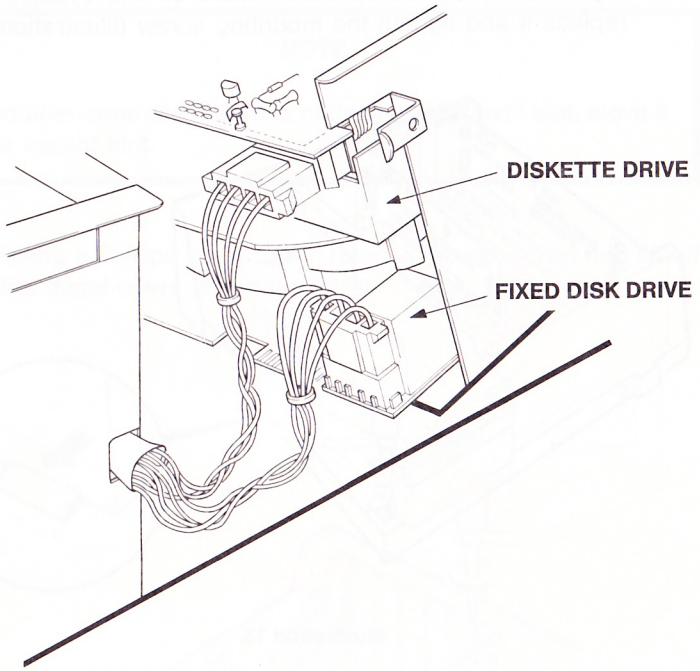


Illustration 12

11. Install the drives into the system unit, and then tighten the two mounting screws (illustration 13).

12. If your computer has a ROM board on the system board, replace it and tighten the mounting screw (illustration 14).

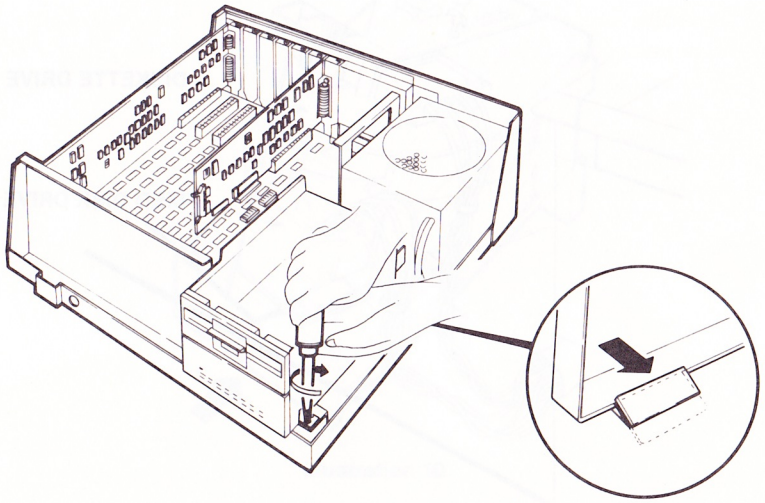


Illustration 13

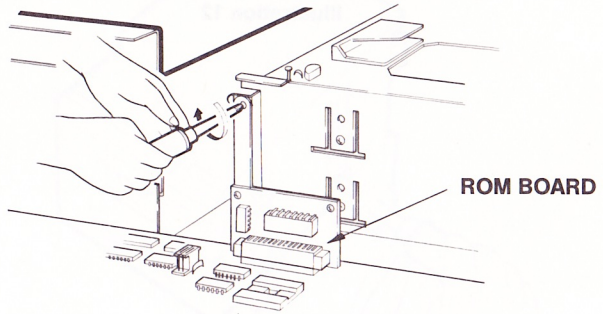


Illustration 14

13. To install the fixed disk drive controller, first remove the metal cover from the sixth slot inside the system unit.

> **NOTE:**
>
> If another controller board is occupying the sixth slot, move it to a vacant slot.

Using a Phillips screwdriver, remove the set-screw and lift off the metal cover (illustration 15).

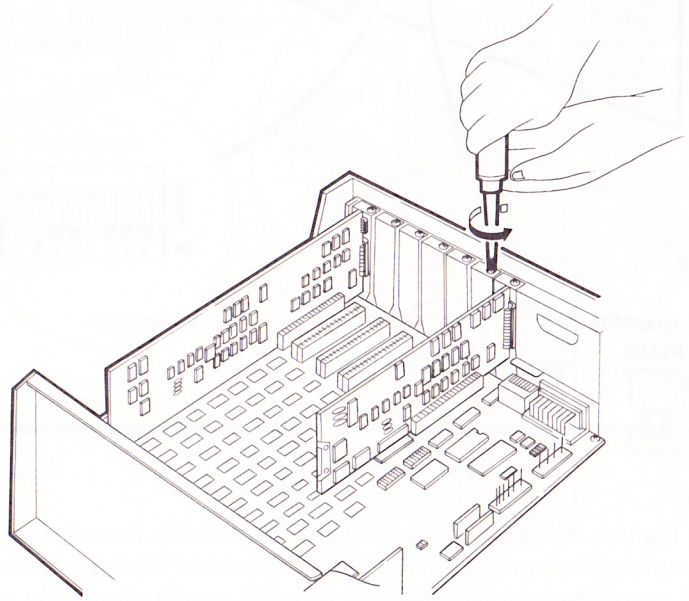


Illustration 15

14. Ensure that the switch and jumper plugs on the controller board are set as shown in illustration 16 or 17.

    If necessary, use something with a fairly sharp point (like a ballpoint pen or very small screwdriver) to flip the switches.

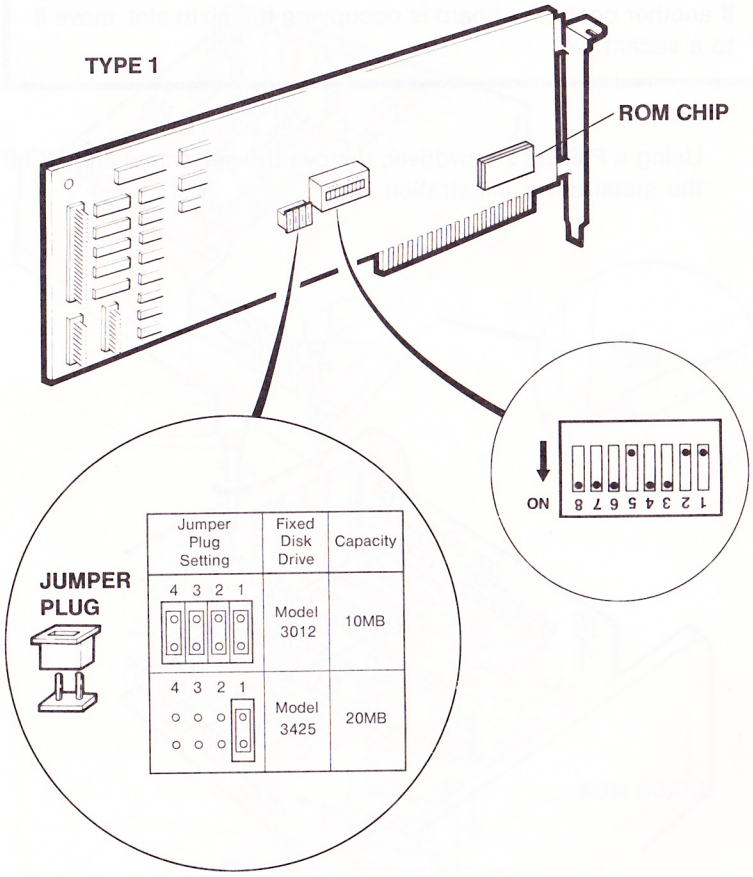


Illustration 16

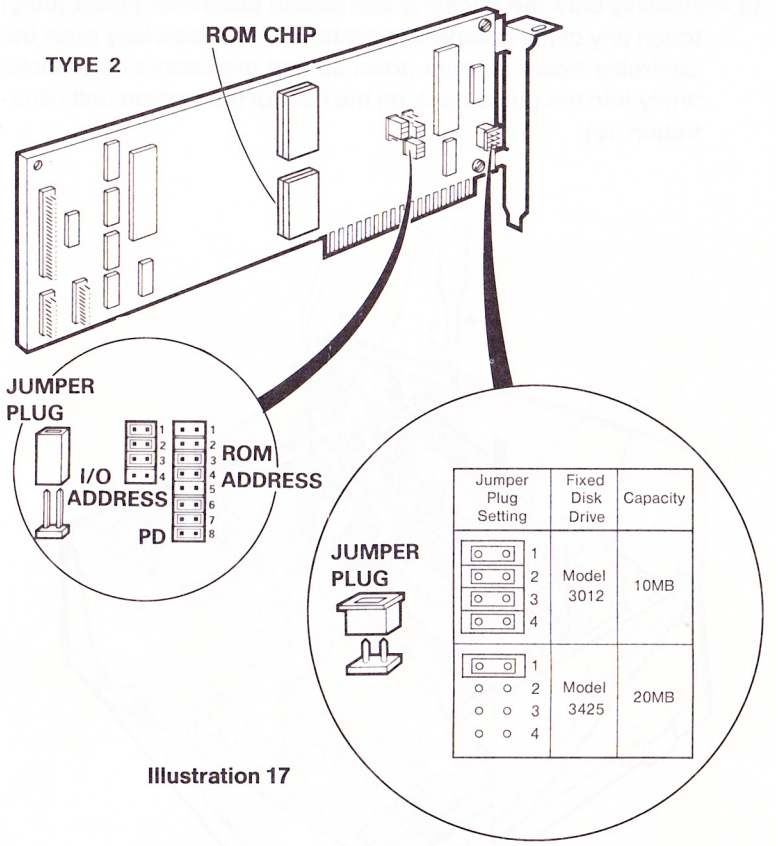


Illustration 17

NOTE:

If you removed a diskette drive to install the fixed disk, you will need to reset SW1 switches 7 and 8 which determine the number of diskette drives. Refer to Chapter 6 for instructions.

If you are using the 20MB fixed disk drive (Model 3425), make sure that the ROM chip on the fixed disk controller is version 2.13 or later.

7. OPTIONS

15. Holding only the edges of the plastic controller board (don't touch any of the component parts or wires), carefully push the controller board straight down so that the bottom edge locks firmly into the guide track on the floor of the system unit (illustration 18).

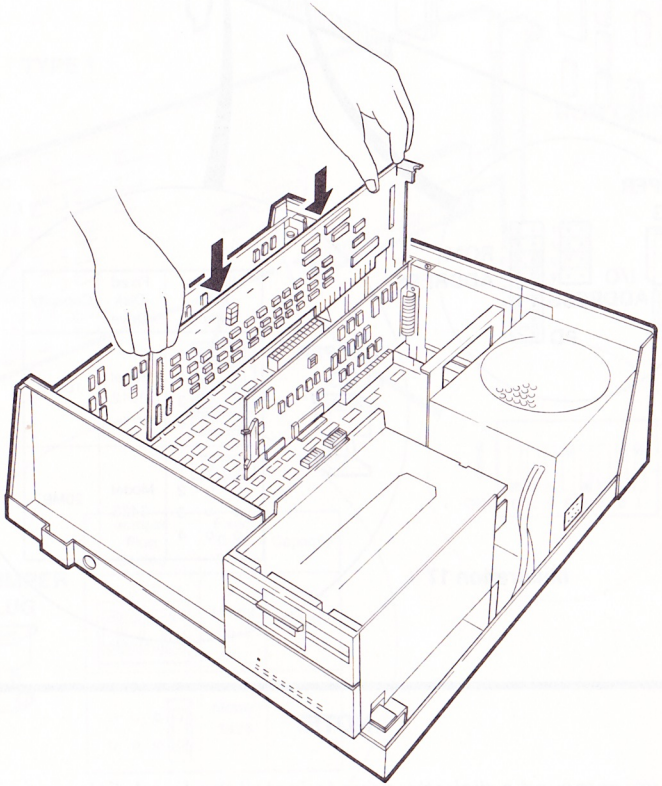


Illustration 18

16. Using the original screw, firmly tighten the new cover plate at the rear of the system unit (illustration 19).

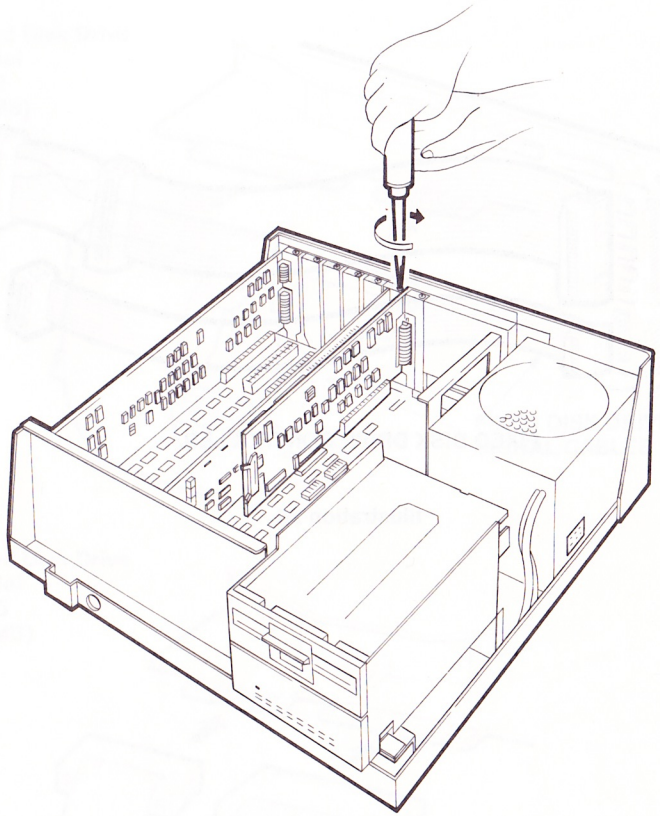


Illustration 19

17. Connect the drive cables to J1 and J2 on the fixed disk drive controller. The orientation of both cables is the same, with the red stripe down (illustration 20).

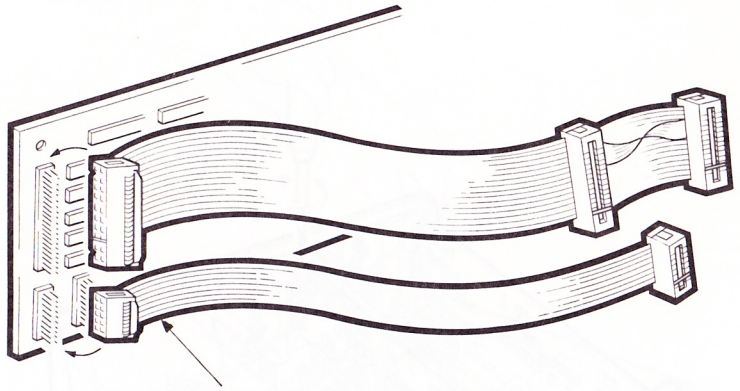


Illustration 20

18. Connect the cables from the controller board to the fixed disk drive and diskette drive (illustrations 21 and 22). Note that the cable must be twisted to align the plug properly.

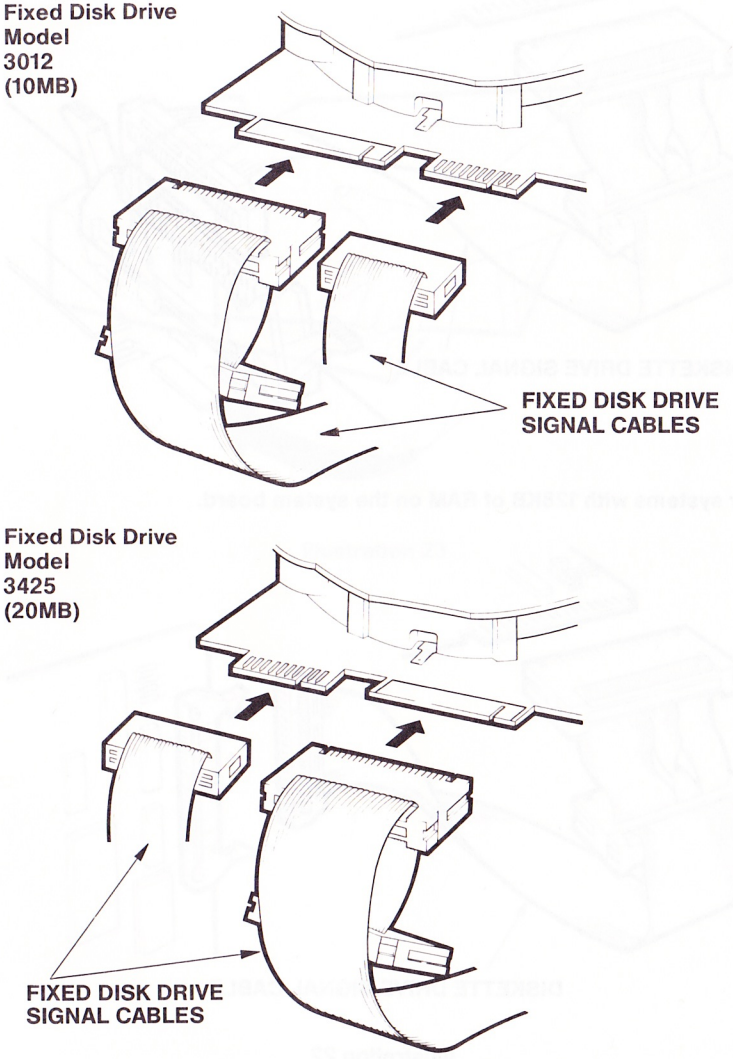
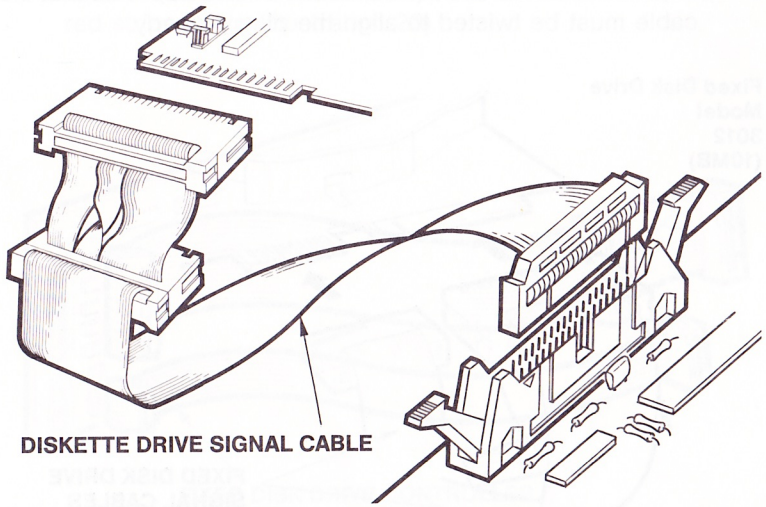


Illustration 21

For systems with 256KB of RAM on the system board.



For systems with 128KB of RAM on the system board.

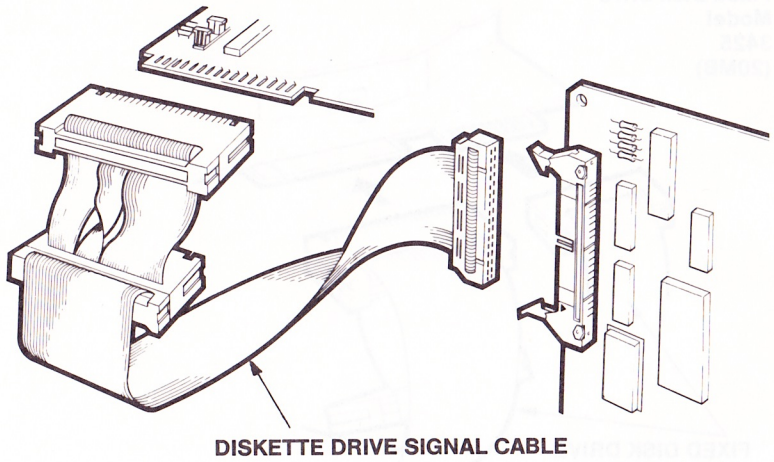


Illustration 22

19. Replace the system unit cover by carefully placing the cover over the unit and sliding it towards the rear of the system unit (illustration 23).

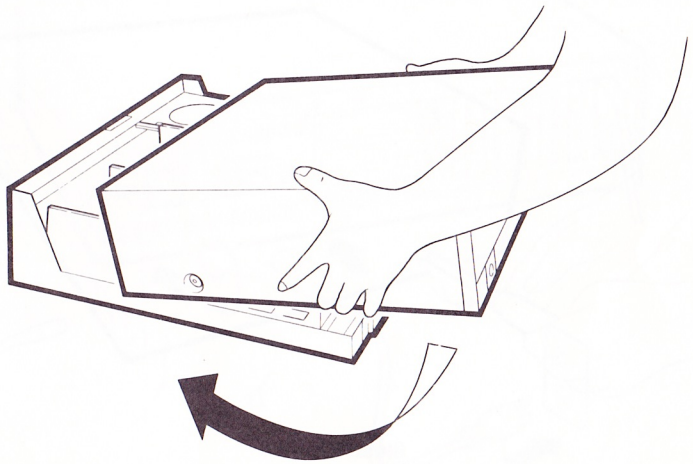


Illustration 23

20. When the cover is back in position, firmly tighten the original five screws (two on each side, one at center rear) (illustration 24).

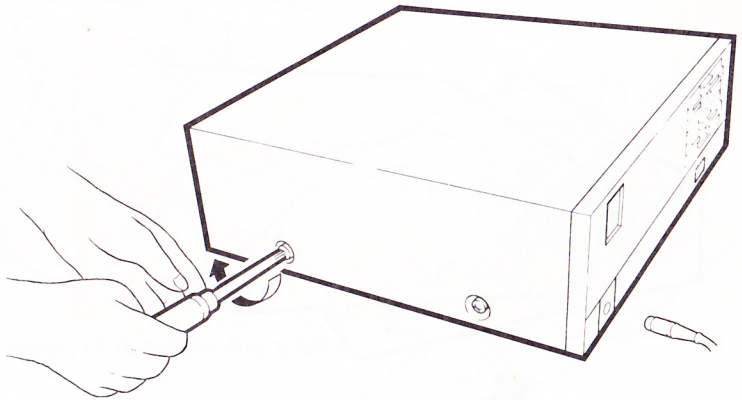


Illustration 24

21. Reconnect all the cables (illustration 25).

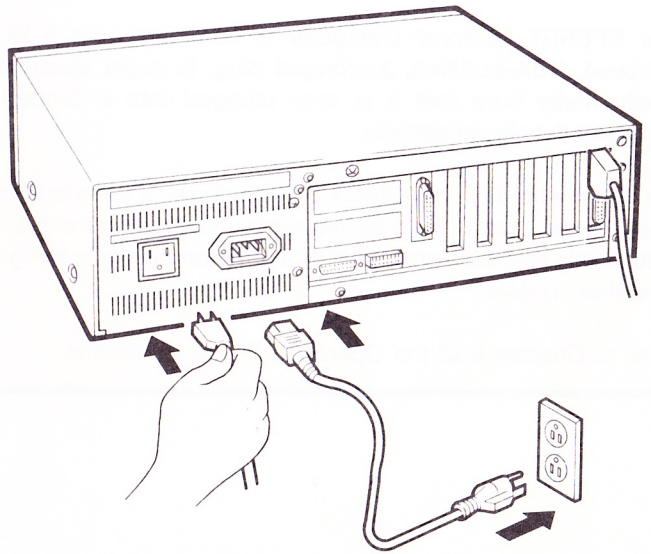


Illustration 25

Glossary

address

A number or a set of coordinates used to identify a location so it may be found again. For example, diskette drives are identified by addresses (A or B).

alternate function

An additional function of a key, which may be activated by pressing the **Shift** key (as on a typewriter), a toggle key such as **Num Lock**, or a control key such as **Alt**.

backup

A copy of a diskette which is made so the data will not be lost if one of the diskettes is damaged. Usually, the backup copy is used and the original diskette is stored in a safe place.

blocks

Units of data of uniform size, such as a given number of lines or characters. Data is usually processed a block at a time.

bugs

A colloquial term for problems in a software program which keep it from running properly.

configuration

An arrangement of connected hardware devices which may vary according to the user's needs.

Glossary

controller board

A unit consisting of electronic parts on a board. Electronic impulses from these boards, directed by programs, make the computer work.

cursor

An indicator on the screen. The cursor is positioned where data is to be entered or at an item in a menu.

cycling

The repetition of a function (such as a character displayed on the screen, an editing function, or a diagnostic test).

cylinder

A memory location on a fixed disk.

default

The preset alternative. For example, the default drive is used unless you specify another drive. One choice in a menu is the default selection unless you request another choice.

density

A term used to describe the amount of data a diskette can store. A double-density diskette can store twice as much data as a single-density diskette.

diagnostic diskette

A diskette containing special test programs used to isolate errors in the system.

diskette

A magnetic recording device, similar in principle to magnetic recording tape, which is used to store data files or programs. A diskette is also called a flexible or floppy disk.

diskette drive

The hardware device which reads from or writes to the diskette. You insert the diskette into the diskette drive in order to access its information or add new information to it.

display monitor

A cathode-ray tube (CRT), like a television screen, which provides a visual display of the information you are working with.

document file

See *file.*

execute

To perform an operation. Computers are said to *execute* instructions.

extension

A 3-letter code used to further qualify a filename. For example, all SPERRY BASIC files are given the extension .BAS.

external commands

DOS commands which are not loaded into the system unit's memory. External commands are retained only on the DOS diskette, so the system has to "look them up" on the diskette.

Glossary

file

There are two types of files: document files and program files. A document file is a collection of information (such as a document or a record) compiled and stored on a diskette by the user.

A program file is a collection of data used to control the computer. (Program files also may be created by the user.)

file codes

Units of information about files. Some commands require file codes to specify exactly what the command is to do.

filename

A name you assign to a file. The system recognizes the filename when you use it to specify which file is to be acted on.

fixed disk

A magnetic storage device which remains in the computer. Unlike a flexible diskette, the fixed disk cannot be removed. A fixed disk has a much larger memory capacity than a flexible diskette, but it is used in much the same way.

format

A procedure used to prepare a disk so it is compatible with the operating system in use.

function keys

Special keys which can be programmed to perform an entire operation with one keystroke.

hardware

The physical devices of a computer system, such as the system unit, display monitor, and printer.

high resolution

A mode of display available only with a high resolution color display monitor. Up to 640 dots horizontally and 400 dots vertically can be displayed on the screen in high resolution, providing sharper characters and more detailed graphics.

input/output

Something that receives and transmits data. A keyboard is an input device. A printer is an output device. A diskette drive is an input/output device because it can be written to and read from.

insert mode

A state of operation in which characters entered shift all subsequent characters to the right instead of overwriting them.

internal commands

DOS commands that are loaded into the system unit's memory when DOS is loaded. Even if the DOS diskette is removed, internal commands are still available.

load

To enter information (such as an operating system or another program) into the computer, frequently from a diskette or disk.

medium resolution

A mode of display available with either a high resolution or medium resolution color display monitor. The screen can display as many as 640 dots horizontally and 200 dots vertically in medium resolution mode.

memory

A device or area into which information can be copied, stored, and later retrieved.

menu

A list of choices which appears on the screen to guide the user.

mode

A particular method or state of operation.

monitor

See *display monitor.*

monochrome

A single color on the screen, such as black characters on a white screen or white characters on a black screen. The personal computer monochrome screen displays green characters on a black screen.

operating system

A software system that controls the operations of a computer system.

partition

A portion of a fixed disk which is reserved for a particular operating system. If you use more than one operating system, each partition must be formatted differently.

peripherals

Separate hardware devices which are attached to and controlled by a computer. A printer is a peripheral.

printed circuit board

See *controller board.*

program file

See *file.*

programming language

A program used to create other programs. Each instruction in the programming language corresponds to machine code instructions.

prompt

A message on the screen that tells you to press a key or enter some data.

read-only

A program or diskette that can only be read from. A read-only diskette cannot be changed.

read/write head

An electromagnetic device, similar to the head in a tape recorder, that can read from or write to magnetic storage devices such as diskettes.

reserved

A word or character which always has a special meaning in a program, and therefore can't be used for variable information such as filenames.

software

Instructions (programs) which direct the operations of a computer.

startup partition

A partition on a fixed disk. The startup partition takes control (loads) when there is more than one operating system on the fixed disk and the computer is started up from the fixed disk.

subroutine

A part of a program (routine) which may be called into operation under certain conditions.

system unit

The central computer of the SPERRY Personal Computer System. The system unit contains the main memory, the diskette drives, and the controller boards for the other hardware devices.

temporary memory

Memory storage within the system unit which is erased every time the unit is turned off. Files you want to keep should be stored on a diskette.

toggle

A device or switch that has two states (such as on and off). Pressing the switch once initiates one state; pressing it again initiates the other.

wild card

A character that can be used to take the place of one or more unknown characters in a filename.

write-protect

To protect a disk or diskette from being changed (written on). DOS software, for example, can be write-protected so the operating system can't be altered. See also *read-only*.

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